Public Safety Wireless Network

PSWIN

PSWN Program Symposium Compilation Report August 1997 – September 1998

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BOOZ·ALLEN & HAMILTON

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During the past year, the PSWN program has sponsored symposiums in Charlotte, NC; Harrisburg, PA; Sacramento, CA; Boston, MA; and Chicago, IL. The purpose of these events has been to discuss issues related to the interoperability of public safety land mobile radio communications and public safety shared systems. During the course of the symposiums, the PSWN program has collected common observations and best practices. This report contains the salient information disseminated and collected at the symposiums. As additional symposiums are held, new information will be added to this report to ensure its completeness in the future.

Principal topics discussed during PSWN program symposiums have included:
- Catalysts and Drivers for Shared System Development
- Partnerships for Shared System Development
- High Level Approaches for Shared System Development
- System Concept Evolution and Development Timeline
- Critical Success Factors for Shared System Development
- User Perspective and Mission Operations
- Senior Executive Perspective
- System Requirements and Capabilities
- Implementation Planning
- Funding
- Project Management and Control Issues
- Spectrum, Coverage, and Other Key Design Issues
- Site Acquisition
- Frequency Regulatory and Licensing Issues
- Regional Planning
- Education and Awareness
- Federal Perspectives on Shared Systems Development
- Federal Programs Overview

CATALYSTS AND DRIVERS FOR SHARED SYSTEM DEVELOPMENT

Recent major public safety events have highlighted the growing demand for multi-agency response teams, which, in turn, has highlighted the need for systems that enable greater interoperability. However, the current environment for public safety radio communications is frustrated by insufficient spectrum resources, inadequate funding, and aging technology. Shared systems provide a means for relieving these frustrations. A number of catalysts and drivers for their development were identified:

- **Spectrum:** Public safety agencies require additional spectrum to alleviate congestion and interference and to support additional services such as mobile data applications. Shared systems allow for the pooling of spectrum resources and, depending on design specifics, can enable the more efficient use of spectrum.

- **Funding:** Mechanisms for funding public safety radio communications are tightening while the cost of technology continues to rise. In many cases, it is becoming prohibitively expensive for individual agencies to procure their own radio communications systems. Many public safety agencies are realizing that consolidation of fiscal resources and capital assets may represent the only way new systems can be afforded.

- **"Reinventing" government initiatives:** In a time of tightening resources, many government agencies are consolidating and leveraging their efforts to achieve common objectives. The development of shared systems for public safety communications is a case in point. Public safety agencies are increasingly compelled to develop shared systems to achieve economies of scale and scope.

- **Availability of Resources:** Public safety agencies may possess or have access to differing resources that can be combined to meet each others needs. One agency may have existing infrastructure and facilities, but lack the financial resources to build upon them. Another agency may have financial resources they can exploit, but no personnel to dedicate to the effort. Many public safety agencies are realizing synergies from combining resources to develop shared systems.

- **Duplication of Infrastructure:** Public safety agencies that can afford their own systems are recognizing that the continued duplication of physical infrastructure and single-agency systems is costly and not emblematic of good public management. For these agencies, developing shared systems is attractive because it is a smarter way to proceed.

- **Access to New Technology:** Many public safety agencies employ less than 25 persons. For these smaller agencies, it is more cost effective to rely on shared systems rather than individual endeavors. Participating in a shared system may be the only way for such agencies to obtain access to new technology and capabilities.

- **A Need to Enhance Public Safety Communications:** The implementation of shared systems enables the broad-based adoption of more technologically advanced radio communications equipment and services, which, in turn, greatly enhance public safety operations. While technological advancement can be achieved through single-agency systems, shared systems accelerate the introduction and integration of new technologies and applications throughout the public safety community.

- **Aging Infrastructure:** Existing radio and microwave systems are becoming obsolete and high maintenance costs are making them less economically viable to sustain individually.

- **Operations in Different Frequency Bands:** Public safety agencies currently employ different frequency bands, ranging from lowband very high frequency to highband ultra high frequency. These differences lead to either incompatibilities in

some situations or in other cases a flexible means of partitioning operations or environments for more effective and efficient communications.

- **Changing Regulatory Environment:** The current regulatory environment requires narrowbanding, refarming, and spectrum reallocation to accommodate shared system development and other schemes that promote interoperability.

- **Advancing Technology:** The current technological environment can allow public safety entities to establish more feature-rich and flexible systems. New technology provides greater clarity than previous technology, supports mobile data requirements, and permits multi-agency use and wide area roaming.

PARTNERSHIPS FOR SHARED SYSTEM DEVELOPMENT

Developing partnerships and participation arrangements is a key first step in establishing a shared system. The developers of each shared system have devised schemes for formalizing and managing the partnerships and participation agreements that are essential to the successful implementation and operation of multi-jurisdictional/multi-discipline systems. Increasingly, formal participation agreements are executed. These agreements allow for varying degrees of participation, responsibility, and use (commensurate with the agreed participation and responsibility levels). Partnerships spread costs, access a broader base of infrastructure, and acquire the best technology for an agency's means by expanding the means. Partnerships also allow entities to leverage investments, avoid duplication of effort, and create a secure and seamless network at lower cost. However, successful partnerships require a cooperative spirit, the willingness to set aside turf issues to move toward common goals, and the commitment, on behalf of participating agencies, to long-term interagency participation.

While many agencies and disciplines participate in shared systems, each participant has different requirements. Allowing for varying levels of participation provides the flexibility needed to meet these differing needs in a manner that is equitable to all the participants. Levels of membership in a shared system are described in terms that include the size of the agency and its potential impact on system loading, the number of member agency users, whether or not the member agency owns and operates infrastructure elements, and the extent to which this infrastructure will be integrated into the shared systems (e.g., partial or full). The financial responsibilities of the system partner are consistent with the terms of its level of participation. Terms such as client member, integrated member, cooperating member, associated member, and commercial member are used to reflect the varying degrees of participation and responsibility of participating members. Several potential partnerships were identified as follows:

- **Public works agencies as participants:** In some instances, public works agencies are included as members of public safety shared systems. Often agreements that allow public works participation are brokered because some public works groups assume public safety roles and responsibilities during times of crisis and need (e.g., trash removal organizations being responsible for deploying their trucks to plow snow during heavy winter storms). In some cases, important public safety and public work functions are organized under one agency and their separation as member and non-

member on a shared system is not practical. Generally, the public safety-related requirements of public works agencies are light and intermittent compared to those of the primary system users.

- **Federal agencies as participants:** In selective regions, federal agencies are joining in shared systems on a limited but sustaining basis. These arrangements stem from the significant and usually unique presence and role that some federal agencies have in certain regions of the country. The integration of federal agencies into these systems is a matter of practical consideration that reflects the current nature of the relationship of these selective agencies with the region's public safety agencies.

- **Certain affiliated organizations as participants:** Generally, provisions are being made for inclusion of certain private, commercial organizations as system members. These organizations are typically contract firms with public safety responsibilities (e.g., private ambulance service companies) or organizations within an institution that execute a public safety responsibility (e.g., fire departments within institutions such as universities or manufacturing plants). As with other partnership agreements, those that govern the relationships with these affiliated organizations are scaled in a manner that is appropriate to their usage needs.

Partnership Models

Increasingly, formal partnership agreements are being executed. These agreements allow for differing degrees of participation, responsibility, and use. In general, three working models of partnership agreements have been identified. These include:

- **Public partnerships:** Public partnerships entail cooperation among government entities. Under this scheme, participating agencies incur lower initial costs, require smaller capital investment, and save money through purchasing by volume. Government owned and operated statewide systems typically rely on the public partnership model, as do systems shared among multiple local jurisdictions. A number of partnerships between state and federal agencies are also beginning to develop. Regulatory procedural differences between NTIA and FCC need to be resolved.

- **Partnerships between public safety agencies and utility companies:** Power and utility companies often partner with public safety agencies because they provide reliable infrastructures, offer interconnection capabilities, and have similar coverage requirements. Partnerships with utilities often allow for inclusion of agencies that cannot afford to upgrade equipment or incur infrastructure costs. Utility companies are often willing partners since their infrastructure and interconnective capabilities do not require major restructuring to accommodate public safety radio communications. Public safety agencies may also bring frequencies to the system, allowing joint utilization of a scarce resource. Utility organizations have a critical need for effective and efficient radio communications to support field communications and usage data collection. Utilities have similar wide-area coverage requirements including a need

for communications in areas that are under-serviced by commercial providers. Utility partnerships also typically provide public safety agencies improved communications to utilities during emergencies. However, common problems with utility partnerships include determining priorities during public safety emergencies, accepting operational decisions made jointly by all users, and providing appropriate systems security. FCC regulations governing the use of common channels between public safety entities and utilities is also an important consideration in coordinating utility partnerships.

- **Partnerships with a private/commercial entity:** Partnerships with private organizations, such as specialized mobile radio service providers or the majority owner of radio sites in an area, are another alternative. The private entities often bring significant capital investment to the partnership, alleviating cost pressures associated with infrastructure construction, site acquisition, licensing, and maintenance. Common issues include obtaining additional frequencies, guaranteeing a limited volume of communications, ensuring channel availability, and providing the necessary security. Partnerships between public and private organizations must conform to the laws and policies governing the public safety entity which may influence network management, procurement, and financing.

Financial Responsibilities in Partnerships

In formalizing partnership agreements, financial responsibilities and payment arrangements must be established to spread the costs of implementing and maintaining a shared system. Common payment structures in partnerships include:

- Fees based on each member's percentage of usage.
- Flat rate fees based on the number of users for a given member.
- One-time access fees.
- Monthly and annual fees.

Common Problems Associated with Partnerships

While partnerships allow participating agencies to leverage their resources, there are common problems associated with partnerships that need to be addressed:

- **Priority and Preemption:** Public safety must have the assurance that they will have priority over other non-public safety related entities in an emergency. It is important to establish standard operating procedures to ensure priority and to document preemption protocols.

- **Overloading:** Systems should be designed to accommodate the increased traffic associated with adding new users as partners expand and new partners are added. Before new users are integrated into the system, system managers should estimate the amount of increased traffic and loading that will be incurred as a result. In time, adjustments to system capabilities may be required to accommodate the increased loads.

- **Talk Groups:** System administrators need to manage queuing and the number and size of talk groups, especially in the early stages of system operations, to avoid excessive reprogramming. Suggestions for doing so include running statistical reports on talk group usage to weed out unused groups, giving agencies test radios before coming onto the system, establishing a hierarchy of priority groups, and discussing talk group designs directly with users. It is frequently the case that a system starts out with a large number of talk groups. In general, this number is gradually reduced as actual usage needs and patterns are identified.

HIGH LEVEL APPROACHES FOR SHARED SYSTEM DEVELOPMENT

Three general approaches for providing multi-discipline, multi-jurisdictional shared systems emerged from the various presentations. These approaches are:

- **"Buy Your Own":** Under this scheme, the participating jurisdictions and public safety agencies come together in a formalized way to pool their resources to build, operate, and maintain a shared radio communications infrastructure that is "owned" jointly by the system partners. Generally this approach flows from high-level political and programmatic commitments, with significant "grass roots" support from radio managers and users.

- **Shared Ownership and Joint Operation:** The second approach is similar to the first in that agencies band together to share infrastructure owned and operated by public safety agencies. However, they do so in a less formalized manner. Participating agencies share their existing infrastructures and devise schemes for joint management and operation. This approach hinges more on agreements and coordination among radio managers and the like then on high-level political leadership or formalized partnership agreements among participating agencies. Instead of a capital-intensive effort to replace several systems with a single new system, this approach involves the "knitting together" of existing systems to establish a shared resource and the subsequent coordinated management and evolution of the aggregate system.

- **The "Virtual Utility Approach":** Under this scheme, a not-for-profit quasi-utility organization provides radio communications services to public safety, public works, and utilities, such as water and power companies. The "radio communications utility" provides its service under a known fee structure and the participating user organizations band together to obtain a "best value" rate. Under this approach, the participating user agencies do not own or operate the infrastructure. Therefore, they do not engage in capital-intensive infrastructure modernization efforts. Rather, through the joint use of third-party infrastructure, the participating agencies essentially create a leased shared system to serve their purposes.

SYSTEM CONCEPT EVOLUTION AND DEVELOPMENT TIMELINE

While there are variations across systems, a common framework characterizes system definition and development efforts. The framework consists of a set of common steps:

- **Preliminary studies** that identify the need for change in general terms (these studies can take a year to complete, are often performed by outside consultants, and can precipitate action immediately upon completion or some time later);

- **Requirements analyses** that formalize the need as statements of desired functionality (these analyses typically take a year to complete, are often done by outside consultants, and are usually followed closely by implementation planning efforts);

- **Implementation planning** that includes identifying funding sources and that results in the systems concept, development schedule, and high-level design objectives (implementation planning can take one to two years, is done in close coordination with key stakeholders, and usually includes support from an outside consultant);

- **Pre-proposal activities** that include the preparation of proposal development packages (pre-proposal activities, which can take six months to nine months depending on the number of Requests For Information (RFI) and the complexity of the Request For Proposals (RFP), are performed by a government agency as project executive and a project team that usually includes consultants);

- **Proposal development and evaluation**, under an RFP process or its equivalent (proposal development is performed by the responding vendors and takes place typically over a three month period while proposal evaluation is performed by the government and its team typically over a 30 to 60 day period); and

- **Source selection and system deployment**, including detailed systems design, evaluation, deployment, testing, and initial operations (source selection and subsequent negotiations typically take three months while system deployment can take six months to a year depending on complexity).

Some additional insights into each of the steps of the framework are presented below.

- **Preliminary Studies.** In most instances, preliminary studies performed 3-5 years ago revealed the need for significant improvements to existing radio communications systems. In several cases, the studies were sponsored by task forces, information technology executive agencies within governments, or major radio systems users, such as the state police. Benchmarking against national best practices was sometimes included as an element of this step. These preliminary studies were not intended as full requirement assessments but rather as means for developing a more structured understanding of the problem. In general, they established the clear need for change. Often these analyses resulted in recommended plans of action, the first step of which was typically a formal and thorough requirements study.

- **Requirements Analyses.** User needs and the operational concerns of radio managers were established through surveys, audits, or other equivalent mechanisms. This information formed the basis for the systems requirements that led to the pursuit of

shared systems designs. The requirements were captured in a formal manner and spoke to addressing current deficiencies as well as to providing additional services enabled by new technologies. Requirements were often gathered by individual user groups and then assembled into a comprehensive volume. The history and background regarding existing systems, and the extent to which these systems have met user requirements, was gathered as well. With requirements firmly established, and with the limitations of the existing systems understood relative to these requirements, more detailed system planning was possible and appropriate.

- **Implementation Planning.** The beginning of a multi-year shared systems implementation effort was generally signaled with the creation of an implementation plan or its equivalent. The purpose of the plan is to lay out the systems concepts, goals, objectives, high-level design considerations and profiles, and resource requirements. For shared systems, implementation planning also included formalizing the ground rules for cooperation and partnership among participating jurisdictions and disciplines. The implementation plan signaled the transition from the studies and analyses phase of the effort, to the solution development and deployment phase. The implementation plan was typically the document that went before senior decision makers and budget analysts to make the case for resource commitments and to establish project schedules. Resource decisions made at this stage often reduce the scope of the development effort, curtail the number of requirements supported, and add additional interim steps (e.g., pilots and prototypes), thereby increasing system development time.

- **Pre-Proposal Activities.** With the commitment of the necessary resources, or a strong indication that resources would be made available at the appropriate times, most shared systems efforts moved into a pre-proposal stage. In most cases, a procurement process that followed the standards of the participating jurisdictions was followed. This process often began with the preparation and issuance of an RFI from potential vendors. Public safety entities are beginning to use RFIs to encourage innovative vendor solutions and identify potential vendor partnerships. The RFI is followed by the preparation and issuance of an RFP. The RFP specifies technical design and cost parameters. A trend among RFPs for shared systems has been an increase in the degree of requirements and performance specificity, as a mechanism for avoiding under-performance problems experienced by some of the early shared systems.

- **Proposal Development and Evaluation.** Vendors prepared proposal packages in accordance with the published RFP. The proposals were evaluated and assessed relative to one another based on several dimensions: the extent to which requirements would be met, the technical accuracy of the design, the cost implications (both up-front and recurring), the operational implications of the design, the implications for maintenance, etc. Proposals were evaluated and scored, usually with the assistance of an outside consultancy. Often vendors were asked to provide clarifications, re-address certain requirements, or make other modifications that resulted in more responsive proposals.

- **Source Selection and Deployment.** Proposal evaluation culminated with the selection of a specific vendor, or vendor team, and the technical design that was advanced in the corresponding proposal. Detailed negotiations ensued to formalize the source selection and deployment agreement through an appropriate contract mechanism. The vendor then proceeded with more detailed system design, followed by system build-out, test, and initial operation until system acceptance was made.

CRITICAL SUCCESS FACTORS FOR SHARED SYSTEM DEVELOPMENT

Several critical success factors have been identified in the shared systems approach. A general consensus regarding the best overall approach emerged—it is one that combines effective top-down strategies (to build senior decision-maker support) with strong "grass roots" initiatives (to establish and sustain support among radio managers and users). The specific critical success factors included:

- Approaching the system design from a customer/user perspective;

- Committing to long term interagency partnerships by opening the system up to all government agencies;

- Helping participating agencies understand and support the objectives of the system;

- Keeping eligibility requirements to a minimum;

- Moving forward collectively to create an infrastructure that will serve all relevant entities;

- Developing detailed system designs and specifications by clearly defining operational needs and requirements with the vendor and participating agencies;

- Endorsing the mission uniqueness of agencies by accommodating agency-specific requirements and ensuring the necessary autonomy through concerted network management;

- Recognizing and pursuing cost advantages of joint service agreements or of building joint systems (achieving certain economies that are not available to smaller, single-agency, single-jurisdiction systems);

- Training participating users to handle and use the equipment correctly, and ensuring that training actually occurs;

- Organizing and energizing core, high-stake users to engage in strong "grass roots" education and, where appropriate, lobbying efforts to increase citizen awareness and senior-level political support;

- Leveraging off of concern on the part of radio managers and users that if they did not join in the shared system they would have diminishing support and resources for maintaining their own systems;

- Developing, encouraging, and capitalizing upon strong user support for change, and for systems that provide a more capable suite of services in a manner that is more seamless than is currently the case;

- Maintaining a good working relationship with the vendor and establishing clearly identified and specified goals and requirements that the vendor must achieve;

- Establishing and maintaining strong administrative support at the highest levels of government involved (e.g., from the Governor for state-wide systems, from county board chairpersons for multi-county systems) to champion the system through the legislative process and through local zoning and approval hearings;

- Building and leveraging strong support from state legislatures through the passage of enabling legislation and the establishment of sustainable sources of funding (e.g., radio communications trust funds);

- Presenting a well-developed business case to government officials. A critical success factor in the development, implementation, and maintenance of a shared system is the creation of a well-defined business plan. By treating the system like a commercial enterprise, the project manager can present a business plan to the state legislature or to local governing bodies to obtain requisite empowerment, support, and funding;

- Securing long-term and ongoing funding mechanisms that will endure throughout the planning, implementation, and maintenance stages of the system;

- Addressing regulatory, licensing, and coordination issues, (e.g., tower construction and zoning obstructions, spectrum allocation, and partnership agreements);

- Recognizing and highlighting the compelling need for improvements to poor and, in some instances, dilapidated radio communications infrastructure, with problems that include inadequate maintenance, poor coverage, increased channel congestion, growing interference, limited services, and structurally damaged towers; and

- Accommodating FCC licensing deadlines (i.e., with expiration dates looming on certain licenses, agencies were compelled to jointly move out on development and implementation efforts).

Unsuccessful Arguments for Change

Some arguments advanced have not proved salient or helpful. Among the items found to be of limited utility were:

- **System Duplication:** Arguments that, absent shared systems, there would be a continuation of system duplication (the prevailing view of decision makers on this point seems to be that the avoidance of such duplication is assumed as a matter of routine good-government practice and not a matter of merit or a selling point for a new concept);

- **High Maintenance Costs:** Highlighting the high maintenance costs associated with the existing systems (the general view of decision makers here being that this is an operating reality that agencies created for themselves as a result of earlier procurements—it is a routine part of doing business for those agencies and, as such, does not merit special treatment);

- **Frequency Refarming:** Discussing the consequences of FCC frequency refarming, which necessitates the more efficient use (and re-use) of limited spectrum (e.g., through shared systems) (it is difficult to establish enough understanding among decision makers and other high-level stakeholders regarding such focused, technical issues to make these issues compel support or action); and

- **Centralization:** Emphasizing the benefits of centralized system design, procurement, operations, maintenance, etc. (in an era of "devolving" responsibilities to the most fundamental levels of government, the centralization argument holds little sway).

Successful "Tools" for Change

Successful arguments for change require a concerted follow-through effort that is enabled, in part, through certain mechanisms resident in the "tool kit" of shared systems developers. These mechanisms include:

- **Creating,** through executive or legislative action, **governing boards,** steering committees, or management councils with sufficient authority to advance the development of a system and to manage and operate it going forward;

- **Obtaining dedicated full-time resources** (e.g., systems engineers, budget analysts) at the appropriate levels to ensure effective handling of key issues (e.g., performing design reviews, addressing funding requirements);

- **Obtaining letters from senior government officials endorsing the system** and its use, and engaging in the diligent and professional handling of the senior executive and legislative government officials and their staffs to ensure proper treatment of issues (e.g., the successful engagement of the legislative process so that bills authorizing the system and establishing its funding sources are passed);

- **Avoiding the use of technical jargon** by identifying and using consistently an easy to understand and inclusive terminology (e.g., describing the user community for the system as members of the "mobile work force" of the participating agencies);

- **Making well developed and consistent presentations** to important existing and potential stakeholders, including the use of professional quality videos that help obtain and maintain buy in from the government executives, legislatures, the citizenry, and other key stakeholders; and

- **Establishing a standing public relations and outreach program** that uses communiqués (such as newsletters), that provides brochures to describe system benefits, that leverages favorable press in trade journals and local newspapers, and that makes use of other mechanisms (e.g., conferences and symposia).

USER PERSPECTIVE AND MISSION OPERATIONS

It is commonly understood that reliable and effective communications are of uppermost importance to system users. In bringing the public safety community together, the PSWN program has been in the position to gather insights into the perspectives of system users and their mission requirements. The following illustrate the particular needs of the line officers in the public safety community.

User Perspective on Interoperability

Several users commented on their view of interoperability requirements for public safety communications. The users indicated that the following were important:

- To have the ability to speak with anyone else in public safety whenever needed;

- To have an agreement within the public safety community to work together toward interoperability;

- To move away from using multiple radios and possess a single radio that would allow communications with other public safety entities coming from and operating within another jurisdiction;

- To possess enough radio equipment for all field personnel, especially portable radios that are lightweight, reliable, and provide full coverage over an entire jurisdiction;

- To possess simple and usable radios that require minimal training and a limited number of features;

- To have the ability to conduct operations over encrypted radios and thereby preclude others from listening to communications on scanners;
- To have the ability to communicate on a channel that is not simulcast to the general public;

- To have the ability to have priority access to a specified channel during emergencies or incident response;

- To have the ability to receive information from other public safety entities before coming into an incident or arriving on scene; and

- To be asked to provide feedback on operational requirements and problems to radio managers and technicians.

Incident Presentation (New Hampshire)

During a one-man, two-state crime spree in which two law enforcement officers and others were murdered, responding law enforcement officers encountered serious communications deficiencies. In the aftermath of the incident, many valuable lessons relating to the lack of interoperability of public safety communications came to light. Several lessons can be learned from this tragedy, including:

- Dead spots precluded dispatchers from hearing complete transmissions of law enforcement officers and officers from hearing dispatchers;

- Portable radios, only in service for a year, could not be used effectively due to a lack of training (e.g., portables had 16 channels but officers did not know which channel to select to talk with each other); and

- Too few agencies on the same system so responding officers had little interoperability when jurisdictional lines were crossed.

Incident Presentation (Florida Forest Fire)

During a five-week period during the summer of 1998, 6,500 firefighters from local, state, and federal agencies converged on Florida to fight 1,700 separate brush fires across the state. A variety of radio communications problems emerged over the course of the emergency. A lack of interoperability severely hampered efforts to sustain a coordinated response to the disaster. There was also a limited number of channels available which limited the responsiveness of the public safety entities. Operational impacts included:

- Firefighters at the same site from different agencies could not communicate with each other. Local, state, and federal fire departments used a variety of communications systems (analog, digital, conventional, and trunked) and operated on different radio frequencies (VHF, UHF, 800 MHz). In one instance, federal agencies received directions to evacuate based on shifting wind conditions, but were not able to relay this critical message to their state and local counterparts at the scene.

- Local agencies had to rely on "loaning" portable radios to other agencies to facilitate joint operations.

- Aerial drops from federal aircraft were delayed because the federal personnel could not monitor the radio communications of local agencies on the ground to ensure the area was clear. Instead, they waited for messages to be relayed through dispatchers.

- Local fire departments were slow to reach neighboring jurisdictions requesting assistance because they were unable to communicate in real time with the state highway patrol, and therefore were not aware that traffic routes had been altered to facilitate evacuations.

- EMS crews were often unable to coordinate locations with regional emergency response organizations and federal agencies. The state had mandated that although Advanced Life Support (ALS) providers had recently upgraded to a statewide 800 MHz system, they should also retain their VHF radios for coordination during disasters. While the radios were available in the vehicles, they often had not been maintained or personnel did not know how to operate them.

Lessons learned from the Florida forest fire include:

- Better communication planning is needed to prepare for large scale emergency response involving multiple agencies and disparate communication systems;

- With multiple agencies involved, communication procedures need to be revised as soon as possible to facilitate coordination with and among field personnel;

- Agreement on a statewide radio platform is needed, including what types of systems should be allowed, so that local and state agencies can interoperate; and

- Extra portable equipment (radios and batteries) is useful for maintaining communication with and among field personnel.

Incident Presentation (Oklahoma City Bombing)

Immediately after the bombing of the Alfred R. Murrah Building in Oklahoma City, radio communications were the principal means to coordinate the disaster response and concurrent criminal investigation. Radio communications between agencies quickly became a significant problem. The communications issues encountered included:

- There was not enough channels available to handle the public safety radio communications. The four primary VHF radio channels used by Oklahoma City Police Department became instantly congested after the explosion as officers throughout the city felt the blast and reported the incident. Further communication with the first officers on scene were hampered by the overwhelming volume of traffic. One of the two Oklahoma City Fire Department radio channels was used by the rescuers on scene. The other channel was extremely congested as it was used to coordinate mutual aid fire coverage for entire city throughout the disaster response period.

- Because all voice channels were busy, initial communication with the command post had to take place over a cellular phone link. Later that day, the command post was equipped with mobile data terminals (MDTs). With congested radio channels, MDT messaging became the only reliable means of communication with the command post at the scene.

- Oklahoma City police and fire departments operated separate communication systems and utilize different frequencies, precluding interoperable voice communications. However, all police and fire units were equipped with an MDT, operating on a separate 800 MHz frequency. MDTs therefore provided a vital communication link between police and fire units throughout the entire incident.

- Responding agencies from other jurisdictions could not communicate with each other. The "mass casualty" assessment was made within minutes of the explosion. One hundred and seventeen agencies, each with separate radio systems, responded to the incident, providing more than 1,500 personnel. Runners were used to relay messages from different agencies.

- Hundreds of cellular phones were provided to commanding officers at the scene to aid in the rescue efforts. Initially, more than 30% of the calls were blocked. Cellular companies provided priority access within hours, resulting in a blocked rate for public safety personnel of less than 2%. The use of cellular phones allowed radios to be used for emergency transmissions, while requests for information, supplies, or additional manpower were made by phone.

Although actions were taken to organize channel use during the Oklahoma City disaster response, there were a limited number of channels available to public safety, all saturated with users and disaster recovery activity. The responsiveness of the public safety entities was hampered by the limited availability of spectrum and the lack of interoperability.

Personnel Safety

- An incident was discussed in which a firefighter had become trapped in an attic during a fire and lost his life. Several points were made regarding the circumstances surrounding the incident and the part that the lack of communications played. These points included:Firefighters who responded to the incident had limited interoperability;

- When emergency transmissions are "stepped on" due to system congestion, messages cannot be delivered and lives can be lost;

- Every firefighter should be provided with a portable radio; and

- A mobile command post could have helped to solve the interoperability problems, but a substantial amount of time is required to make a mobile command post operational.

SENIOR EXECUTIVE PERSPECTIVE

It is often actions and decisions taken by senior executives within government that are critical to the successful development and long-term operation of radio communications systems. The following items were cited by senior executives as major challenges to shared systems development:

- **Building support from politicians:** Interest among elected officials needs to be raised through a variety of avenues. It was suggested that elected officials need to first be persuaded that the issue is directly related to the public's safety. Building the political impetus can be facilitated through the use of the media, as well as by grassroots efforts by user associations to lobby their local legislative representatives. Ultimately, support is often garnered through high-level, persistent "politicking" and advocacy by senior executives.

- **Gaining cooperation from other public safety entities:** The safety of field personnel, and therefore the operational needs of the users, is one of the two primary issues that compels decision makers to explore participation in a joint communication system. The prospect of saving an agency or jurisdiction money, not only in up-front development costs but also recurring operating costs, is also a powerful argument in favor of shared systems.

- **Maintaining trust with partners:** Trust must be established by involving all participants in a shared system development project from the beginning of the process. The advantages of sharing will eventually overcome skepticism and concerns regarding control. Additionally, open and frequent communication among partners is essential. Multiple committees of colleagues (e.g., chiefs, managers, technicians, users) can be used to facilitate joint decision making and maintain personal contact between participating entities.

- **Working with vendors to meet public safety needs:** A common dilemma for senior executives is radio communication vendors who are not responsive to public safety needs. Public safety entities need to be able to drive the marketplace so that vendors will partner with public safety to develop solutions to the interoperability problems. Vendors need to be convinced that public safety is no longer interested in proprietary systems that will not adapt to an open architecture environment.

SYSTEM REQUIREMENTS AND CAPABILITIES

As radio and microwave systems become obsolete, many completed and to soon-to-be completed systems have been planned to meet minimal "needs" now, with the intent to meet "wants" in the future. It was established that it was important to create a system that can be built upon in the future. Other requirements and capabilities of shared systems that are under development include system reliability, interoperability, improved radio coverage, mutual aid

operations, and mobile data. These requirements and capabilities can be supported through the use of digital radio technology.

Shared systems in place or under development are meeting or are being engineered to meet a number of specific requirements including:

- Seamless communications while roaming over great distances (enabled largely through trunked simulcast systems);

- Transmission of voice and data often over the same systems and provision of high-quality grade voice service (enabled largely through digital systems);

- Data communications for field reporting, database inquiries, messaging, geographic information services, vehicle location and other positioning services;

- Encryption of the information transmitted over the shared radio system particularly to support sensitive investigations;

- Support for end-user equipment that includes hand-held portable radios, vehicle-mounted mobile radios, and mobile data terminals that are vehicle mounted but that can be removed for use in other environments;

- Significant in-building radio communications;

- Ability to accommodate peak usage needs; and

- Backwards compatibility with existing technology

Systems are being designed to meet these requirements in the face of a set of design constraints and conditions that can vary significantly from development effort to development effort as well as within a particular design effort itself. These items include:

- Varying terrain, foliage, ground cover, and climate conditions;

- Varying population densities and concentrations in urban, suburban, and rural areas;

- Varying shapes and sizes of the coverage areas;

- Varying requirements for mobile, portable, and in-building coverage depending on population profiles, jurisdiction characteristics, and other factors;

- Varying numbers and types of subscriber units;

- Varying intensities of different types of public safety agencies within a region; and

- Varying degrees of participation from agencies that are only occasionally considered public safety agencies.

IMPLEMENTATION PLANNING

In the planning stage, system implementation requires basic choices about all aspects of the system development process. A basic assessment of resources and personnel is essential in mapping out the best approach to system implementation.

Approaches to Project Planning and Management

Five basic approaches to project management and engineering appear to be used by the entities responsible for the development of shared systems. The approaches vary according to the extent that the engineering management work is performed "in-house" by the responsible government agencies, is contracted out to consulting firms or systems integrators, or is left to the vendors themselves. The five approaches are described below.

- **Extensive in-house involvement:** This approach is possible only if the sponsoring government agencies have sufficient numbers of personnel with the appropriate skills and experiences. Agencies with a sufficient complement of such persons typically organize these persons in an engineering group that acts as an internal consultancy on technology matters. Irrespective of personnel considerations, this approach is usually pursued only when the sponsoring government agencies are willing to directly assume the risks associated with the project. Incorporating an outside firm within the project leadership team represents a means of risk sharing. This approach is more common when the system design and implementation are more routine and technically straightforward. This approach is less common as system complexity increases.

- **Partnership-based:** A variation of in-house management, this approach uses the combined systems integration strengths of participating agencies to plan all aspects of the project. This approach helps solidify bonds between the partners and provides a high degree of ownership in the system through the efforts of an inter-agency team of integrators.

- **Intermediate in-house involvement with comparable levels of consulting support:** This approach is typical of large-scale efforts led by government agencies that have the appropriate indigenous personnel but that wish to diffuse the risk and responsibility for project management by integrating a professional services firm into the management structure. For example, under this formulation the government agency may act as the general contractor (depending on the amount of infrastructure development that is required) while a consulting firm may act as the project manager, establishing detailed schedules and coordinating work efforts.

- **Minimal in-house involvement with extensive consulting support:** This approach is typical when the responsible government agencies have a minimal complement of

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technical personnel capable of managing in detail the entire program development and implementation effort. Under this approach, the government agencies are general managers of the effort and contractors provide all required project engineering and management functions. The contractor personnel form the "virtual staff" of the responsible government agencies.

- **Vendor provision of project management functions.** This approach is the closest to a pure "turn-key" approach whereby the selected vendor handles all aspects of the project, from beginning to end. Third-party consultants that can provide an independent view of project management and system development are not a part of the project team, typically because project complexity does not merit it or because the project resources cannot sustain third-party contractor involvement. Panelists stressed that these arrangements must be carefully managed through a well-written contract to produce expected results.

Best Practices for Implementation Planning

A seamless implementation and system transition can occur if the users, vendors, and contractors are properly managed. The following items were cited as key enablers for success:

Users

- **Train the users in the operation of the new system:** The users must be trained to use new equipment and services. Therefore, it is important to revise training processes and to develop checkpoints to determine how well users are listening and learning. The best trainers tend to be managers who have a stake in the operation of the system. Training the managers first, as trainers for the larger body, may help reduce problems as the users move out into the field.

- **Perform field tests:** Field tests provide users with an understanding about how the new system will work. They also provide system integrators with actual experience regarding the daily use of the system. In either case, they add an important practical element to system acceptance.

- **Plan the transition from old to new equipment:** Compose a detailed transition plan and retain the old system until the users feel comfortable with the new system. If there are not enough internal resources to plan and manage such a transition, an outside consultant should be hired to facilitate the process.

Vendors and Contractors

- **Vendor dedication:** Generally, finding a dedicated vendor is a key success factor in the customer/vendor relationship. Good vendors will provide quality assurance and the desire to work side-by-side with the customer's team to develop the system and solve unforeseen problems.

- **Require the vendor to verify system operation and ask the vendor many questions:** Communicate with your vendor and make sure that the systems are operational. Ask questions to clarify any uncertainties and persist until issues are addressed.

- **Hold the vendor accountable for system reliability:** Vendors should be required to put their commitment for system reliability in writing. Most presenters and panelists suggested provisions that tie the contract to a certain amount of service time before the completion of each milestone is agreed and paid.

- **Ensure contract soundness:** Before implementation begins, it is important to have a sound contract in place. The contract needs to be quantifiable, detailed, and provide sufficient accountability. A typical contract should have a clear scope of work, payment schedule, warranty, performance specifications, and a payment holdback scheme. A typical holdback payment agreement provides 70% upon delivery, 20% upon installation, and 10% upon total overall satisfaction.

- **Establishment of measurable specifications in the contract:** When creating a design plan , it is important to establish measurable specifications in the contract. If there is ever a deviation from the contract, the customer can refer to and depend on the contract as a guarantee that all deviations and discrepancies will be resolved. When it comes time to integrate and build the system, customers should ensure that all tasks are measurable and agreed to by the vendor and the customer.

- **Relationship to vendor:** The relationship between the customer and the vendor can be described as a marriage of sorts. Approach the relationship as a strong business partnership that will endure.

Pitfalls in Implementation

Several pitfalls could be encountered by public safety officials when implementing their system. These pitfalls can be classified as political issues and vendor and construction issues.

Political Issues

- **Public Awareness:** It is important to educate the public about the need for and use of public safety radio communications systems. Educating the public about the system will not only garner support for the system but will also allow the public to feel that the government is not trying to "slip something past them. "

- **Zoning and Regulation:** This issue appears to be the most common challenge faced by public safety system implementers. Dealing with these matters can be very time consuming and can delay implementation, but implementers should make a concerted effort to keep a cool head and jump through the necessary hoops. Often this requires attending a number of hearings regarding tower site zoning.

- **Local-User Perception:** The perception of the local user can either act as an inhibitor or serve as a catalyst for system implementation. The panel stressed the need to talk to the local users and educate them about the system. Educating the local user can help system implementers manage user perceptions of the system's capabilities and can transform the users into the system's biggest advocates.

- **System Must Work:** It is acknowledged that most projects will fall behind schedule or run over budget. However, if the system does not accomplish what it was designed to do, then there is no forgiveness. Therefore, make sure that the system does what it was set out to do.

Vendor and Construction Issues

- **Vendor contracts:** Public safety officials who have implemented systems suggest writing out, as much as possible, the exact role that the vendor will play in implementation. This includes writing a retaining fee into the contract. For example, the State of Michigan retains 10 percent of the cost of the system until the entire system is built and operational. This gives the state or region some leverage with which to negotiate with the vendor to insure that the system works properly.

- **Hidden costs:** What many system managers typically do not know or understand is that there can be substantial hidden cost associated with system implementation. Accessories for subscriber equipment can be costly (i.e., batteries, carrying cases) and, if system modernization includes dispatch centers, there are the costs of furniture and of fixtures. The training of users can also be a cost that many people forget to take into account.

Being aware of these common "pitfalls" can greatly enhance the success of program implementation.

FUNDING

The majority of public safety agencies employ less than 25 persons and typically these agencies are unable to secure the sums of money necessary to modernize and maintain their systems. Obtaining these large amounts of funding may be the greatest challenge confronting public safety agencies as they plan for system upgrades and replacements. For instance, a National Institute of Justice interoperability survey of 3,000 law enforcement agencies indicated that funding for radio systems was the number one concern of radio managers and users alike.

Costs Involved with Land Mobile Radio (LMR) Systems

Various cost groups represent the funding necessary for developing shared systems:

- The funding requirements of expansive systems (e.g., highly user-inclusive statewide systems, multi-county systems among populous counties, systems that provide mobile

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and portable roaming on a wide-area basis) are typically $120-$200 million (exclusive of end-user equipment costs and of maintenance and operations costs going forward).

- More ambitious large-scale efforts, which include full portable and mobile coverage, end-user equipment, and additional infrastructure such as new towers, can require as much as $400-$500 million.

- Small and mid-sized efforts still require tens of millions of dollars of initial capital, at a minimum (notwithstanding annual recurring costs for operations, maintenance, and equipment replacement).

- The funding requirements for shared systems can be quite large (e.g., as much as $200-$400 million in capital expenditures). The cost of system consolidation, development, and upkeep over long time horizons (e.g., 10 years) can be as much as $1-3 billion. Management and advisory committees are often key to ensuring funding and seeing to the effective expenditure of money as projects proceed.

Working with Vendors

The amounts of funding required to build and maintain radio infrastructure throughout the country suggests that the public safety LMR market is a large one. However, there is a general sense that public safety LMR needs represent a small fraction of business for vendors (e.g., 10% or less of their business). There is a growing sense that at the state level, public safety might be able to gain favorable pricing with manufacturers. The PSWN program conducted a study to estimate the replacement value of public safety LMR equipment (subscriber units and owned infrastructure) nationwide as a gauge of the size of the LMR market itself. The results of the study estimate the value to be $18.3 billion, inclusive of the LMR equipment owned by public safety agencies at all levels of government. The $18.3 billion includes $15.4 billion in local LMR equipment, $1.7 billion in state LMR equipment, and $1.2 billion in federal LMR equipment. This estimate represents the current-day replacement value of public safety LMR equipment and does not include lease costs or operating and maintenance expenses. It also does not account for the additional costs associated with system architecture changes that would help achieve interoperability, spectrum efficiency, or system security.

PSWN Funding Mechanism Report

Recognizing that funding is of major concern for radio managers and users alike, the PSWN program has recognized the centrality of this issue and has initiated a set of studies to identify funding sources and strategies. The PSWN program-sponsored Funding Mechanisms Report for Public Safety Radio Communications provided a snapshot of funding sources available for public safety radio communications systems. The study tracked funding sources from government channels to the public safety community. The study also examined existing innovative partnerships between government and private entities which fund radio communications infrastructure projects. The funding report illuminated two main findings:

- There is no nationally available and sustainable public safety radio communications funding source, and

- There are more resources available to law enforcement agencies than to fire departments and emergency medical systems.

Funding Sources

Due to the magnitude of the funding requirements, most initiatives require a large infusion of funds directly from the sponsoring government agencies. In cases where large commitments of money have been made, the system developers have or will receive a significant direct appropriation from a state's general revenue fund or from a capital investment fund, for example, or have or will be the direct beneficiary of targeted, multi-million dollar capital investment bonds or their equivalents. Often, a precursor to success in receiving this level of funding was to achieve smaller funding successes, where the system developers received sums of $200,000 to $1 million to perform feasibility studies, to test concepts on a limited basis, or to execute other "pilot" projects. Sometimes these start-up funds were secured directly from government budgets. In other cases, external grants from the federal government, for example, were used or funds cobbled together by participating agencies from their general operations accounts were applied.

Actions of state legislatures were agreed upon as the most common source for additional funding, including bond issuance and establishing a user fee surcharge. Another source of funding discussed was partnering with private companies. Each of these is discussed in further detail below.

- **State Bonds:** The State of Michigan funded its system by issuing a state bond. In addition to this bond, general fund money, which is employed for the communications needs of the Michigan State Police, was utilized.

- **User fees:** This source of funding was discussed more in the context of operations and maintenance purposes rather than for building a system. This method of funding levies a fee on any public safety official wanting to use the system. This approach divides the cost of the infrastructure by the number of users to determine the fee; therefore, the more users a system has, the lower the user fee. The State of Florida secured funding through a state law, which allocated a dollar surcharge from every automobile and boat registration in the state. This action created the necessary funding to implement its public safety communications system, but it did not cover all of the cost. This legislation also has a sunset provision that expires in 2003. The State of Florida is currently looking to either extend this provision or secure other sources of funding.

- **Partnering with Private Companies:** This option includes leasing tower space to private personal communications service (PCS) providers. An example is the State of Delaware's partnership with a private company that leased space on a state-owned tower for PCS use. The revenue generated through this arrangement supports system operation and maintenance. Another example of this option is the State of Florida

who issued a Request for Proposal (RFP) to hire a private company to manage the state's tower sites. These site managers are responsible for marketing the site and obtaining the appropriate permits. In return, the state will retain a certain percentage of the revenue. Although partnering with private companies is a viable option, some states are prohibited from doing so. For example, the bond that the State of Michigan issued to fund its system is a tax-exempt bond. As such, the infrastructure being financed by the bond can have only a 5 percent non-governmental use. This source of funding prohibits the state from leasing space on its tower to generate more funding.

Best Practices for Securing Funding Revenue

The following actions were identified as best practices for securing funding.

- Regarding major statewide initiatives, including new system development as well as system upgrades and maintenance, it is important to show that costs are kept at a minimum and to follow the appropriate restrictions on how state assets and revenues are used.

- Take a business perspective, approach the shared systems project as a joint capital investment, and demonstrate how the costs can be spread over multiple years.

- Market the project, particularly to politicians controlling the purse strings, by drawing out the program benefits and selling the project (e.g. show the system's close affiliations with popular public safety functions). It is important to illustrate system value in tangible terms and garner state official's ownership stake in the system.

- Formalize development objectives and schedules as elements of strategic planning documents.

- Take both high-level political and grassroots approaches.

- Ensure direct contact with state and/or local officials, either one-on-one or in small groups.

- Have a "story."

- Satisfy as many sources of funding as possible.

- Find a champion for your cause (e.g., the governor).

- Develop the cost factors necessary to satisfy the financial managers.

- Master the cost data to avoid having the financial managers as adversaries.

- Tell the truth from the beginning regarding project costs and requirements to avoid the impression of future "scope creep" and maintain credibility with elected officials.

- Use consultants to "buy" credibility and ensure cost methodology and projections are reasonable.

- Start as soon as possible to build a favorable constituency (e.g., voters, media).

- Be creative in identifying sources of funding.

- Be persistent – securing funding may take multiple attempts and entail a variety of different funding strategies.

Creative Solutions to Funding Problems

In instances where large sums were not forthcoming but where initiatives were pushed past pilot stages, creative solutions to funding problems were sought. For example:

- **Cost sharing agreements** were devised among participating agencies at the working level to facilitate system improvements. These agreements could treat each site in the network as a cost center. Data is acquired for each site, e.g., showing air time or the number of end-user units in use by a given agency. These data are converted to percentages that determine a user's cost for maintenance and operations of that site. Costs for building additional sites are in part defrayed through partnering arrangements with private entities, such as power companies.

- In other instances, **a leased-service approach** was adopted thereby eliminating the need for large infrastructure investment. Service lease costs, along with standard end-user equipment buys, generally remain within the available operating budgets and resources of the participating agencies.

- Under most formulations, **agencies remain responsible for their end-user equipment**. However, the system maintenance and operations costs are shared among participating agencies in a manner that is proportionate to a given agency's use of the infrastructure. The cost-sharing scheme is typically among the issues addressed in the agency's participation agreement. As with their end-user equipment, agencies usually fund their share of maintenance and operations costs from their operating accounts.

- The PSWN program is performing a study of different funding sources. One scheme discussed was generating revenues by leasing tower space on government property for use by cellular and other wireless service providers. However, unless such a scheme is designed appropriately, public safety agencies may not benefit. The funds may be deposited into a state or county general account and may be used for other purposes. In some instances where public safety shared its towers with commercial services, it was not generating enough profit to cover costs. This situation arose because the state had to pay for a representative to be present at the tower if the

commercial user was performing an installation. In other instances, statutes prohibit public safety or other government entities from being in competition with private industry (e.g., companies that build and provide towers). In some cases, however, there are movements to create statutes that would allow public/private partnerships.

Funding LMR Systems as Information Technology (IT) Projects

The issue of funding radio systems as IT projects yielded two points-of-view:

- **IT review boards may be more receptive to future upgrades and requisite funding:** IT review boards, based on the expertise of those who comprise these boards, may better understand the need for software revision updates, upgrades of equipment, and certain risk migration strategies. The ability to tap this knowledge base may make an IT review board more receptive to the funding needs of public safety for modernizing and maintaining radio communications systems.

- **IT paradigm for program evaluation may be problematic for radio systems:** The process for evaluating IT projects does not address the problems of acquiring spectrum for radio communications and of procuring real estate for sites. Both are essential components of radio system development and both can be major cost drivers. However, IT review boards are not accustomed to dealing with these issues.

Marketing Public Safety Radio Communications to Funding Bodies

The critical issues surrounding public safety radio communications must be more effectively marketed to governments and citizens. Unlike the general awareness that accompanies requests for increased funding for education and highways, funding for public safety radio communications is largely misunderstood by governing bodies and the public at large. Legislators and budget officers need to understand the need for additional funding to procure and maintain radio communications systems, as well as the evolving nature of radio communications technology. Likewise, communities need to understand how radio communications directly affect their safety.

- **Elevate the importance of public safety radio communications:** The public safety community needs to elevate the critical need for radio communications infrastructure and the funding needed to modernize and maintain these systems. Public safety and public safety systems need to be placed at the same priority level as an effective highway system and a ready national defense. Certain education efforts can be employed to help policymakers understand LMR technology and the impact the lack of funding has on public safety's operational readiness and capabilities.

- **Promote LMR systems in layperson's terms:** Public safety radio communications and related funding requirements need to be communicated to local, state, and federal governing bodies in order to justify requisite funding. However, the highly technical issues must be made understandable to policymakers. "Layperson's guides" written by non-technical personnel are one means for explaining the issues in non-threatening

and easy-to-understand terms. The text should avoid technical jargon and should employ inclusive terminology and empirical data to help streamline the message to legislative and budgetary bodies. Explanations to political representatives need to be clear and succinct.

- **Promote LMR systems using direct stakeholders:** Use the users to "sell" the need for radio communications systems and to articulate to policymakers at all levels of government how essential radio communications are for efficient and effective operations.

- **Speak with one message:** Coordinate messengers and ensure that the message is consistent. Avoid the "us versus them" syndrome when discussing the requirements of specific elements of the public safety community. Approach policymakers through a concerted and coordinated effort.

- **Build relationships with the community:** Communicate to citizens the compelling need for a societal commitment to public safety communications infrastructure and the possibilities of what could happen without much needed funding.

Common Funding Mechanisms

Many public safety agencies employ similar funding mechanisms and tap into similar revenue sources to fund radio communications needs. The most common revenue sources and funding mechanisms include:

- **Surcharges:** State and local governments impose surcharges on services. Surcharges for public safety are typically imposed on automobile and boat licenses, and on telephone services. Although surcharges are a common means of generating revenue, many panelists noted that they do not generate enough financial resources to support the full life cycle of a public safety radio communications system.

- **Specialized Funds:** State and local governments often create special funds that hold revenues for a targeted purpose, such as 911 call centers and public safety in general. These funds are financed through tax revenue, surcharges, and intergovernmental transfers. Often unused money can be returned to the fund for later use.

- **Directed Taxes:** Taxes, such as income or sales, are sometimes earmarked for public safety radio communications.

No matter what combination of funding mechanisms is used, it is essential for public safety agencies to develop a funding and finance strategy that will establish a long-term funding source to support the various stages of shared systems development.

PROJECT MANAGEMENT AND CONTROL ISSUES

Approaches to management and control of shared systems vary. In some cases, they are highly structured and formal (e.g., cooperative agreements, stratified levels of participation, well structured priority schemes). In other cases, the combined operation of a shared system hinges on a simpler device, such as turning each shared site into a cost center. Generally, ownership issues are being resolved through the careful design and implementation of joint ownership and management schemes.

Basic Principles of Project Management and Control

It is generally agreed in the public safety community that managing and controlling a shared system is a daunting task. The following detail a number of suggestions regarding this issue.

- **Determine Management Structure:** In some instances, high-level state planning documents address management and control issues. In other cases, management and control is vested in the majority partner, although the minority partners retain some concern for addressing their unique needs. Mechanisms such as communications resource management boards and professional mediators can be stood up to assist in decision making and exception managing.

- **Build Consensus:** Effective management and control depends on developing and proceeding from a high degree of consensus on project goals. Consensus needs to be built upon from among participating law enforcement, fire, EMS, and public service organizations and is usually formalized through some written agreement.

- **Pool Resources:** Agreements often require all users with frequencies to pool their resources. Those agencies without frequencies usually pay a fee. The agreements also typically establish levels of customers and partners, with priority going to public safety talk groups, and call for system directors elected by the system users.

- **Standard Operating Procedure:** It is agreed that a written standard operating procedure is needed. This procedure offers the system some sort of framework within which to operate.

- **The "KISS" principle – "Keep It Simple Stupid:"** Technical people often request equipment that is too sophisticated. The sophisticated equipment ends up making the system more complex than it needs to be. Therefore, managing and controlling a system that is too complex can add unwanted headaches.

- **Say No:** A system manager has to have the ability to tell people "no." Trying to please everyone leads to pleasing no one.

- **Use Time Wisely:** The level of control a system manager has is directly proportional to the amount of time invested in system control.

Best Practices for System Management and Control

A number of best practices for managing and controlling a shared system were generally agreed. These points include:

- **Establishing system capabilities upfront:** It is important to establish the extent of system capabilities with partnering agencies before a partnership agreement is formed and finalized. A "no surprises" approach to enumerating the functionality of the system and to establishing the ground-rules for joint system use and operation is essential.

- **Managing provision of features:** As a basic rule, radio equipment should be kept as simple as possible to address the mission requirements of users. It is important for system managers to make a detailed assessment of how the system works and then determine what features will be provided. Features such as telephone interconnect and private call can have a non-trivial impact on channel usage and system performance. Once features are provided, priority access schemes need to be identified and the use of features needs to be monitored on an on-going basis.

- **Conducting pilots of various technology solutions:** Pilots provide a realistic demonstration of a technology's capabilities and allow agencies to learn about the benefits in their own environment. It is important for users to experience the technology first hand. Pilots also provide a means to maximize competition and gain knowledge that precludes vendors from over-promising technical solutions while under-promising resource costs.

- **Maintaining the ability to change your plan:** Staying flexible increases the likelihood of satisfying management and control concerns of stakeholders. Designing and implementing partnership agreements almost always is a "bumpy" process. Management flexibility facilitates this process, as do contracts that can be modified to accommodate necessary changes.

- **Managing key players:** The expectations and actions of users, the executive office, the legislature, in-house staff, quality assurance contractors, and vendors can significantly affect the planning and implementation stages of a system. Strategic handling of key players is essential for successful system development and for the subsequent management and control of the network.

- **Establishing common mechanisms for control:** Formalized agreements, stratified levels of participation, and well-structured priority schemes were discussed as mechanisms for control. The following are key points:

— It is important to negotiate solid vendor contracts as a controlling mechanism. These agreements should contain clear scope-of-work stipulations, payment schedules, warranty provisions, and measurable performance specifications.

— It is equally important to survey users, to define talk groups that address user operations, and to specify a standardized priority scheme for emergency situations.

— It is important to document agreements and standard operating procedures regarding all aspects of system management (e.g., users, coverage, features, priorities, maintenance, security) and have each agency sign these documents to prevent any misunderstandings as to what was agreed upon.

- **Assembling a solid, well-staffed organization:** Employ individuals with technical expertise and use these individuals to perform several levels of review. Such an investment will save money and prevent reworks.

- **Supporting and managing the expectations of the user community:** Before establishing a system, talk to the users to ensure their requirements are met. Efforts should be made to address actual day-to-day user requirements before less routine needs are accommodated. It is important to communicate with users to determine a realistic range of functionality that meets operational requirements, as certain add-on features could increase maintenance costs significantly. System managers should consider using a consultant to provide technical and engineering support to help the users define their needs.

- **Using third parties as appropriate:** The use of consultants and integration contractors can help organizations better manage and control their systems. Such third parties tend to have significant experience designing and building systems. However, they may not be best positioned to understand all of the roles, responsibilities, and operational considerations of agencies involved in the project. It is important to balance the benefits of consultant support with the limitations of their expertise.

- **Maintaining a systems focus:** As new users come onto the system, those tasked with management and control need to maintain and perpetuate the identity and goals of the system to prevent a loss of focus and direction. It is important to continuously communicate the project goals and risks to the users, old and new alike, and to update operational processes and procedures to balance specific user needs with system considerations.

SPECTRUM, COVERAGE, AND OTHER KEY DESIGN ISSUES

Another gating issue for shared system development is the availability of a sufficient amount of spectrum that is configured in a manner that affords enough flexibility for the intended applications.

Most system developers are implementing 800 MHz systems because the amount of spectrum needed is available at 800 MHz. Not all shared systems being implemented are 800 MHz systems, however. VHF systems are being put in place as well, although systems developers involved with VHF efforts can face a significant challenge in acquiring sufficient amounts of spectrum. In general, where VHF has been selected over 800 MHz, the decision was made on a frequency availability basis.

Reports of coverage and performance problems at 800 MHz have persisted. To better understand these problems, some system developers performed tests prior to their commitment to an 800 MHz system. Antenna placement and site location appear to be critical design parameters for 800 MHz systems, more so than for VHF and other low band systems. In addition to testing, system developers are hedging against 800 MHz coverage problems by including very detailed coverage requirements in their RFPs (e.g., link performance parameters for specific buildings and specific floors within specific buildings). While this is one means of addressing potential coverage problems, it may cause vendors to over-design the systems and drive systems costs to very high levels.

Whether operating at VHF, 800 MHz, or in some other band, the general technical characteristics of shared systems in place or under development are that they are digital (sometimes mixed mode, i.e., analog/digital), narrowband, trunked, and configured for some degree of simulcasting. In addition, network management akin to that done on computer networks and other automated information systems is more prevalent among current-generation radio communications systems. Data and voice are often accommodated over one common infrastructure (however, the commercial service Cellular Digital Packet Data is a commonly used alternative for data transmission). Some implemented solutions are consistent with Project 25; others are not. Consistency with TIA-102/Project 25 is generally not made a requirement or condition of the RFP.

In many cases, significant improvement to physical infrastructure has been required. Replacing old towers, installing new ones, and equipping them with power and providing roadway access, are additional important design considerations. In many instances, the physical infrastructure of existing radio systems is in terrible disrepair. In other cases, it is inadequate to provide the necessary coverage. Some agencies have compensated through remedial measures (e.g., placing repeaters in vehicles) that have become integral parts of the physical infrastructure.

SITE ACQUISITION

The most common obstacle faced in the site acquisition process is opposition from local communities to the development of tower sites in "their backyard," due to aesthetic and health concerns. Another common and more recent obstacle is competition for site locations from commercial wireless service providers. Due in part to these factors, two years are generally needed to identify, lease, and develop a typical site to be used as part of a statewide system. However, panelists advised leaving an additional six-month window for unexpected delays.

The FCC provided an overview of regulatory issues affecting wireless antenna facilities siting. Most of the regulatory authority for antenna placement, construction, and modification is

handled at the local level, although a few instances of federal preemption can be cited. The Telecommunications Act of 1996 requires local governments to act on applications within a reasonable period of time and that denial of application must be in writing, based on substantial evidence in a written record. The FCC has established regulations regarding radio frequency (RF) emissions. If a proposed placement meets these requirements, a local government cannot deny placement based on RF emissions.

The primary role of the FCC in antenna siting is to register antenna structures and ensure compliance with the National Environmental Policy Act of 1969 (NEPA). Antenna structures higher than 200 feet above ground level must be cleared with the Federal Aviation Administration (FAA) (i.e., determination of "no hazard' and registered with the FCC). NEPA requires an Environmental Assessment (EA) to be filed if the site is environmentally sensitive or if excessive RF emissions exist. Situations requiring EA documentation include:

- Officially designated wilderness areas or wildlife preserves;

- Threatened or endangered species or designated critical habitats;

- Historical or archaeological sites or Indian religious sites;

- Floodplains;

- Significant changes in surface features (e.g., wetland fill, deforestation, water diversion);

- High intensity white lights in residential neighborhoods;

- Excessive RF emissions (as defined by FCC's Office of Engineering and Technology); and

- Other situations as required by the FCC or as petitioned by an interested person.

An FCC representative noted that opposition groups can use NEPA to delay a site acquisition.

Best Practices Relating to Public Relations

Effective public relations will help mitigate and dispel the myths associated with the development of a tower site. Education on the need for a tower is one of the most important actions to be taken in the site acquisition process.

- **Leverage political and executive support:** Political and executive backing at all levels of government can prevent and mitigate opposition. Relationships with local representatives are particularly beneficial. It is important that system planners thoroughly communicate the utility of the site through presentations that include

panoramic pictures of the tower and the surrounding area. It is essentail to educate all potential government supporters and decision makers.

- **Educate and inform the surrounding community:** Community resistence to the construction of a tower seems to be inversely proportional to the community's understanding of the benefits of the tower. Counsels, boards of supervisors, commissions, community action groups, and local citizens need to be educated and informed of the direct relationship between the tower and the safety of the community's citizens. As the message regarding the site's utility is communicated and understood, community opposition typically decreases.

Best Practices Relating to Pre-Site Implementation Issues

An exhaustive review of pre-site implementation issues is a way to manage the risks associated with the site implementation process. Common best practices include:

- **Conducting risk assessments:** Risk assessments of the potential site will save time and money in the future and will guard against unexpected opposition. Investigate potential NEPA issues and keep good records to demonstrate findings in case of petitions by opposition groups. Explore geotechnical (e.g., foundations, drainage), property (e.g., access roads, underground storage, power to site), and safety (e.g., safety zones, glide paths, asbestos, security) issues of potential sites. Research all existing local ordinances.

- **Identifying and securing sites:** Potential sites must be secured before contracting with a vendor. Minimize the loss of time and money by securing tower sites well in advance of major system milestones.

- **Considering innovative site and design solutions:** Investigate the use of innovative design solutions for towers. Some public safety agencies have employed techniques that camouflage towers in an attempt to alleviate aesthetic concerns. This can be costly however. Other approaches might include using the roof of a public facility or placing antennas on light fixtures at athletic fields. Consider partnerships with industry or other governments to co-locate on existing structures.

- **Using independent contractors and leased tower space:** Independent contractors can facilitate the site acquisition process and, in turn, save time and money. Another option is leasing a tower site from a commercial tower-site provider. Under either option, the zoning process and the need to build towers become concerns for third parties to handle. However, some public safety agencies are reluctant to depend on tower space owned and operated by non-government entities for security reasons.

FREQUENCY REGULATORY AND LICENSING ISSUES

The two organizations primarily responsible for telecommunications issues affecting local, state, and federal agencies are the FCC and NTIA. The FCC is responsible for licensing

radio frequencies to non-federal public safety agencies and establishes policies and regulations governing that use. The NTIA is responsible for licensing radio frequencies for federal public safety agencies and serves as the President's principal advisor on telecommunications matters.

In June 1995, the FCC and NTIA sponsored the Public Safety Wireless Advisory Committee (PSWAC), a year-long effort targeted at developing a broad vision for the communication needs of the public safety community. The PSWAC studied the current and future requirements of public safety agencies for radio spectrum and wireless communications and developed recommendations to meet those requirements. These recommendations include:

- **Spectrum:** Public safety agencies need 95 MHz of additional spectrum through 2010;

- **Interoperability:** Local, state, and federal public safety agencies must come together to solve the interoperability problem; and

- **Funding:** An alternative source of funding needs to be developed.

In August 1997, the FCC and the NTIA formed a Public Safety Communications Joint Working Group to address the PSWAC recommendations. Of immediate concern for the Joint Working Group is the Balanced Budget Act of 1997, which includes a provision to reallocate 24 MHz of spectrum between 746-806 MHz for public safety use. This plan for reallocating spectrum stems from the PSWAC recommendation for an additional 95 MHz. The 24 MHz of spectrum at issue is currently being used by TV stations and has not yet been reallocated.

The FCC issued a Second Notice of Proposed Rulemaking (Second Public Safety NPRM) in response to this provision for reallocation. Through the Second Public Safety NPRM, the FCC sought input from the public safety community on how to best use the additional public safety spectrum. Highlights of the Second Public Safety NPRM follow:

- Setting a goal to solve the interoperability problem among public safety agencies;

- Proposing a significant amount of spectrum devoted specifically to interoperability;

- Proposing regional committees be given licensing responsibilities;

- Proposing voluntary Cellular Priority Access (CPA); and

- Proposing to further develop a regulatory framework that encourages competition.

The FCC emphasized that the NPRM proceedings are not restricted to the reallocation of the 24 MHz of additional spectrum. The NPRM also addresses longer-term issues surrounding public safety radio communications, such as interoperability, regional planning, and the continued use of aging radio communications equipment. The Commission's position is that the Second Public Safety NPRM is the best opportunity for public safety agencies to shape the

policies that are the foundation upon which public safety agencies' radio systems are built and the FCC encouraged public safety agencies to participate fully in the rulemaking process.

On August 6, 1998, the FCC adopted a First Report and Order (First Report) and a Third Notice of Proposed Rulemaking (Third NPRM). They were released to the public on September 29, 1998. There will be a period of time for the public to file a petition for reconsideration to the First Report and respond to the Third NPRM. The FCC provided a general outline of the contents of the First Report, including rules for licensing portions of the 24 MHz of additional spectrum:

- A National Coordination Committee (NCC) will be established to provide a national structure to establish standards for coordinated spectrum use, particularly for interoperability purposes;

- Spectrum is channelized into narrowband and wideband channels that will accommodate voice, data, image, high speed data, and video transmissions;

- From the 24 MHz of spectrum in the 700 MHz band, 12.6 MHz is designated for general use, 2.6 MHz for nationwide interoperability purposes among all public safety agencies, and 8.8 MHz is reserved for future designation;

- The Third NPRM seeks comments on how to perform licensing and administration of reserved spectrum; and

- The Third NPRM also seeks comments on a variety of other issues:

  - Alternative proposals for use and licensing of the 8.8 MHz;

  - Plans for 2.6 MHz of interoperability spectrum;

  - Designation of interoperability channels below 512 MHz;

  - Technical solutions to address possible interference problems to global navigation satellite systems; and

  - Methods for obtaining Year 2000 compliance information.

The FCC urged public safety agencies to answer the Third NPRM, support the NCC, and closely monitor the market penetration of digital TV, which will affect the availability of this spectrum for public safety use.

Both the NTIA and the FCC have set rules and procedures regarding progressive spectrum management. Spectrum coordination for shared systems among federal systems is difficult and is not very well facilitated by current NTIA procedures. The PSWN case study in the Washington, D.C. area, which includes numerous local and federal public safety agencies, may become a test case for creating shared systems with significant federal participation. It may lead the way to new schemes for coordinating spectrum among federal users. It may also

highlight the need for changes to FCC rules to make the licensing and assignment of spectrum more flexible at the state and local levels.

Part 90 of the Commission's rules covers land mobile radio systems. Currently, Part 90 is not set up for shared systems. Shared systems developers at work today are the pioneers who could assist the FCC to make needed changes. Current FCC rules require waivers to obtain licenses for shared systems. Partnerships with federal agencies also require waivers. The waiver applications need to show that the system is unique, that it will be created for good cause, and that no system alternative exists. FCC rules are designed for a particular service or way of doing business; waiver applications need to show the effect of the waiver on the associated service. The waiver application also needs to establish that the proposed system concept is important or unique enough to merit exemption from the designated service.

In evaluating waiver applications, the FCC considers a number of factors:

- How the proposed concept would enhance the safety of personnel and the public;

- How the concept would promote interoperability and increased mission coordination;

- How the system would provide spectrum efficiency;

- What the cost savings to the municipality or state would be; and

- How the system would improve the services provided to the participating departments and states.

The NTIA and the FCC are concerned with public safety but both need to balance several issues. The public safety community is competing against broadcasters and wireless service providers for spectrum. The public safety community needs to develop a better understanding of the requirements and needs of commercial service providers in order to offer compelling rebuttals to rulemakings regarding spectrum issues. Understanding distinctions between commercial and private service is important as shared systems are created. For example, selling excess capacity on a shared system could constitute a commercial venture. The FCC hopes to keep public safety spectrum private and separate from commercial service spectrum. The FCC will be watching for when a shared system might become a commercial service to ensure that the appropriate licensing schemes are applied.

The FCC appears interested in long term solutions to some of the current shortfalls found in its rules today. Some believe that FCC rules need to be relaxed, that the states should be allowed to administer them, and that procedures need to be more regional-based because the same rules would not work for the entire country. Others believe that regional-based rulemaking needs to be sponsored by an appropriate federal agency or program and that a strong guiding national hand was missing from current regional planning processes. Resources need to be provided to support these planning processes. Educating key stakeholders about spectrum issues is another key matter. Senior-level individuals associated with organizations like the International Association of Chiefs of Police and the Major Cities Chiefs for the U.S. and

Canada (with 55 major chiefs) likely do not understand important spectrum issues. Yet these individuals will need to push for spectrum policy changes and system funding, and they will make decisions about shared systems development.

REGIONAL PLANNING

There is much debate surrounding the use of 800 MHz as an operating frequency for public safety as well as the effectiveness of the National Planning Process. For instance, federal agencies do not use 800 MHz channels for communications purposes, which is a huge barrier in establishing an interoperable wireless network. Also, geography plays an important factor in a decision to utilize 800 MHz; for instance, no area in the State of Montana utilizes an 800 MHz communications system because certain factors, such as terrain, preclude the use of an 800 MHz communications system.

There are both positive and negative aspects of the effectiveness of the National Planning Process. Positive aspects include the following:

- The planning process was a good starting point for addressing interoperability;

- It established some operational standards for certain channels (i.e., mutual aid channels); and

- The NPSPAC process, despite some of its problem, could be used in the allocation of the 746-806 MHz spectrum by using the existing committees and the expertise obtained.

Some of the negative aspects include:

- The process lacked sufficient oversight or guidance in developing Regional Plans. The NPSPAC Final Report recommended a review committee to help mediate interregional problems, however no such committee was instituted;

- No common database was established to identify what the channels were being used for or who was using them; and

- The NPSPAC plan did not allow for ways to interoperate with anyone using the general pool frequencies.

EDUCATION AND AWARENESS

In addition to providing a forum for sharing information, the symposiums provide current information to educate and raise awareness about topics of special interest in the public safety community.

Tutorials

In response to suggestions from symposium attendees, the PSWN program offers tutorials in conjunction with symposiums. The tutorials were designed to educate and inform the public safety community about topics of interest. The following tutorials have thus far been offered by the PSWN program:

- **System Planning A-Z:** This tutorial provided an introductory overview to the major elements of devising major wireless network projects. The tutorial covered all aspects of life-cycle planning and system development, including helpful strategies to better design, manage, and implement major radio system projects. This tutorial also provided a discussion of common pitfalls associated with system planning and implementation.

- **Let's Talk About Trunking:** This tutorial provided an introduction to trunking technology. Two perspectives, theoretical and practical, were used to provide a balanced understanding of trunked radio systems. The theoretical perspective involved a high-level discussion of the technical concepts that make trunked radio systems work, features offered by trunked systems, differences of trunked system management as compared to conventional systems, and compelling reasons for implementing trunked systems. In addition, the tutorial also included a discussion on an example operational 800 MHz trunked system operated by the Council of Governments in the Washington, D.C. metropolitan area.

- **Understanding Frequency Refarming:** This tutorial provided a review of the frequency coordination process using the TSB-88 methodology. Spectrum refarming results in a more detailed and complex frequency coordination process to accommodate the fielding of bandwidth efficient narrowband technologies. Discussions focused on the additional information now required for efficient frequency coordination, including differing channel widths, types of modulation, and channel performance requirements. In addition, co-channel and adjacent channel interference considerations were outlined. After descriptions of the modeling and acceptance testing procedures were provided, a variety of scenarios were presented of the types of evaluations performed under the TSB-88 methodology

Security Briefing

There are emerging security issues associated with evolving public safety radio communications systems. These issues include the need for security from an infrastructure protection perspective, the cause of new security threats and vulnerabilities, and the security challenges that face the public safety community.

Currently, evolving public safety digital land mobile radio (DLMR) systems are envisioned as operating as large automated information systems (AIS) with open interfaces providing digital-based interconnectivity with other systems and subsystems. While the latest

DLMR technology will increase the efficiency and effectiveness of public safety communications, a host of security risks could be introduced unless effective mitigating actions are undertaken based on security awareness and understanding. Most importantly, digital radio systems must be configured and managed in a way that will provide adequate protection from computer-based threats. The majority of DLMR systems now being rolled out across the country are not undergoing any form of security assurance process.

Four security-related issues are at the core of developing an understanding of security procedures for DLMR systems. These issues are the lack of

- An understanding of the security threats, vulnerabilities, and risks associated with the evolving DLMR systems;

- Clearly specified communications security needs for public safety organizations;

- Security standards or guidelines applicable to DLMR systems; and

- An understanding of the tools and techniques available to secure these systems.

Maintaining Awareness on Spectrum Issues

Spectrum issues have been discussed at length with the public safety community and have provided a greater understanding of the complexities of the issue. Topics have included:

The Second NPRM for Public Safety Before the FCC (WP Docket 96-86): The FCC provided an explanation of how the current allocation proceeding of 24 MHz of spectrum for public safety use is being approached. Keys to this approach are:

- Meeting the demonstrated and expressed needs of the state and local public safety user community;

- Encouraging and facilitating both short term and long term interoperability;

- Planning conservatively given the assumption that additional spectrum is not likely to be made available to the public safety community in the foreseeable future;

- Building in maximum flexibility;

- Shortening the waiting time for access to this spectrum;

- Advancing the values of community, competition, and common sense;

- Integrating this band into a long term plan for all public safety spectrum;

- Attempting to reasonably balance the competing goals of encouraging the implementation of advanced technologies and minimizing costs to users;

- Delegating authority to the appropriate regional or national body; and

- Selecting simple regulatory solutions.

Public Safety and Radio Spectrum Guide: The Public Safety Radio Spectrum Guide was developed to draw attention to the remaining spectrum needs of public safety (73.5 MHz, as identified by the Public Safety Wireless Advisory Committee). Specifically, the PSWN program has positioned the guide to educate public officials about, and foster support for, the various issues surrounding public safety radio spectrum. These issues include:

- The scarcity of spectrum;
- The distribution of public safety agencies within spectrum bands; and
- The lack of a firm transition plan for reallocated spectrum

The guide was developed in partnership with the Associate Attorney General's office and the National League of Cities (NLC). It has been distributed to Congress, the National Fire Caucus and through NLC stakeholders. For additional information on spectrum and other topics related to public safety communications, the PSWN program web site can be found at www.pswn.gov.

FEDERAL PERSPECTIVES ON SHARED SYSTEM DEVELOPMENT

Federal, state, and local public safety officials have common radio communications needs. Increasingly, daily operations, joint task forces, and common crisis response teams necessitate more seamless, interoperable communications among and between local, state, and federal public safety officials. Shared systems that span the local, state, and federal levels of government represent one means of addressing these common needs. However, there are key differentiating factors that distinguish the needs of federal users from those of state and local officials.

- **Wide Area Systems:** Federal agencies, by virtue of their missions, have a much larger geographic area to cover but a much smaller number of users to accommodate. Federal systems are inherently wide area systems that are used by a more specialized group of public safety officials relative to the users of state and local systems.

- **Frequencies:** Federal systems operate at frequencies that are different from state and local systems. Increasingly, state and local systems operate in the 800 MHz band where federal agencies do not have any allocations. This key difference may become more acute with the allocation of an additional 24 MHz at 800 MHz for state and local public safety use.

- **Encryption:** Federal agencies generally have a much higher set of information security requirements than state and local agencies.

- **Proprietary Issues:** Federal agencies do not have a strong track record for sharing systems among themselves, thus making the cultural shift to sharing with state and local officials that much more difficult to achieve. The need to maintain control and agency priority at the federal level is another complicating factor.

- **Cost Sharing:** The question of how to equitably divide the costs of a shared system challenges the concept of a federal-state-local system.

- **Overloading:** The potential for federal users to overload the systems during peak usage periods complicates development.

Another important consideration is that there can be no "one size fits all" approach to incorporating federal agencies within a shared systems architecture. Factors that may vary by agency include the extents to which federal agency personnel and technical staff:

- Will assist with the **design and management** of the shared system;
- Will be responsible for **security** management; and
- Are available to support **system development**.

Local officials managing shared systems will need to meet individually with each federal agency seeking participation to discuss:

- Operations;

- System problem handling;

- Funding; and

- Other joint issues.

No forum currently exists to facilitate this dialog. In addition, there is no single point of contact for information on the federal radio communications user population. Each federal agency would need to be asked how many users they would have on the system, and what their expansion plans are.

Despite these challenges, it is important for local, state, and federal radio managers to share information and new ideas. Increasingly there is a commitment on the part of the federal government to work with state and local governments to start solving existing communication problems. The advent of the PSWN program is an indication of this commitment. On-going and future PSWN program studies will address the appropriateness of shared local-state-federal systems and will identify where the potential for such sharing seems greatest. A key motivator for all is to ensure that taxpayer dollars are spent wisely by minimizing unnecessary redundancy. Increasingly it is important for agencies to work together to define a coherent, cost effective radio communications architecture.

The Public Safety Wireless Network (PSWN) Program

The mission of the PSWN program is to plan and foster the implementation of interoperable public safety communications systems. The PSWN program is using a multi-pronged approach to develop a national implementation plan for interoperability. In support of this approach, the PSWN program is currently pursuing major activities that include technology assessments, shared systems studies, spectrum analyses, case studies, testbed participation, and program planning and outreach.

To further ensure local, state, and federal participation in achieving interoperability, an independent intergovernmental committee was created to provide guidance and senior-level support to the PSWN program. The PSWN Executive Committee is composed of senior executives from local, state, and federal public safety agencies who have proven expertise or accomplishments in the field of law enforcement or public safety communications and information technology.

Several products of the PSWN program are available to members of the public safety community:

- PSWN Program Status Report, July 1997 - December 1997

- PSWN Program National Performance Review Booklet

- 800 MHz Study Report

- Report on Funding Mechanisms for Public Safety Radio Communications

- LMR Replacement Cost Study Report

- Monthly Spectrum Policy and Legislative Report (January - July1998)

- Radio Spectrum Policy and Legislative Issues Report

- Commercial Spectrum Auctions Reports (Volumes I, II, and III)

- Public Safety and Radio Spectrum Guide

- Commercial Services Reports (MSS, PCS, Nextel)

These reports are also available through the PSWN program's web page at www.pswn.gov. Through the release of its reports, the availability of the web page, and the sponsorship of events such as symposiums, the PSWN program is providing an "information

clearinghouse" to assist local, state, and federal public safety agencies implement interoperable radio systems.

The Interagency Working Group on Funding of Public Safety Wireless Communications Systems (IWGF)

The National Performance Review (NPR) Access America report includes an action item that calls for the Departments of Justice, the Treasury, and Commerce, and the Federal Law Enforcement Wireless Users Group (FLEWUG) to establish an interagency working group to develop recommendations for alternative ways to fund public safety wireless communications systems. The IWGF was established during 1998 and submitted a proposal to the Office of Management and Budget (OMB) that would provide federal seed money for statewide system planning and development, subject to meeting conditions related to interoperability and other factors. The IWGF proposal is under consideration by OMB.

800 MHz Study

The PSWN program commissioned the consulting firm Booz·Allen & Hamilton to perform an independent evaluation of the relative merits of 800 MHz as an operating frequency for public safety. The report documenting the findings of this study was distributed to symposium attendees for their review and comment. The report was discussed briefly at the conclusion of the PSWN program presentation. Key findings include:

- Some interoperability improvement has occurred with 800 MHz systems;

- Regional plans for using 800 MHz frequencies were created from templates;

- Membership in regional planning committees was not fully representative of all public safety users in a region;

- Lack of adequate funding affected participation in the regional planning process and limited the implementation of new 800 MHz systems;

- Proliferation of a variety of incompatible 800 MHz systems has limited the ability of public safety agencies to achieve nationwide interoperability; and

- Misconceptions exist concerning the propagation characteristics of 800 MHz systems.

National Institute of Justice (NIJ) Law Enforcement Interoperability Study

In 1997, the NIJ administered a survey on law enforcement interoperability. The NIJ's National Law Enforcement and Corrections Technology Center, located in Denver, Colorado developed the survey. The purpose of the survey was to compile quantitative data from state and local law enforcement agencies nationwide on their current and future use of communications equipment and services and on their experiences with interoperability. The 11-page, 268-question survey was sent to over 2,700 state and local law enforcement agencies, sheriffs'

offices, and "special police." A total of 1,334 agencies answered the survey for an overall response rate of 48 percent.

Key findings of the survey are documented in the report *State and Local Law Enforcement Wireless Communications and Interoperability*. This report is available through the NIJ website. Key findings regarding law enforcement interoperability include:

- The need for interoperability is common among law enforcement agencies. Funding and radio frequency incompatibility are identified as the most significant barriers to interoperability.

- Thirty-five percent of law enforcement agencies believe state and federal mandates are needed to ensure interoperability, but the majority believes local planning best meets their needs. Many agencies indicated that funding would make mandates more acceptable.

- Discrepancies in state and local perceptions on formal state interoperability plans suggest the need for more dialogue between state and local law enforcement agencies on the issue of interoperability.

NIJ Video – "Why Can't We Talk?"

In September, 1998, the NIJ completed a high-quality informational video emphasizing the importance of communications interoperability and other radio systems issues to the public safety community. The 13-minute video includes testimonials from emergency services personnel, police officials, firefighters, and policymakers who have encountered interoperability-related problems and proposed solutions. The target audience for the video is high- or mid-level state and local public officials. The video can be used in conjunction with efforts to educate decision makers about public safety radio communications and the critical need for interoperability.

PSWN Program Fire/Emergency Medical Service (EMS) Interoperability Study

The PSWN program's Fire/EMS Interoperability Study is a complement to the NIJ law enforcement study. This study surveys fire and EMS organizations throughout the country to further the understanding of public safety interoperability challenges. Responses to a mail-in questionnaire provides insight into the current radio communications infrastructure supporting the fire and EMS communities, defines interoperability requirements for these communities, identifies shortfalls, and determines the level of knowledge among fire and EMS officials regarding key communications technologies.

The PSWN program distributed 3,339 questionnaires throughout the fire and EMS communities and responses are due September 1998. Upon completion, the findings from the law enforcement and fire/EMS surveys will be combined to develop a baseline of information regarding public safety communications interoperability. The PSWN program plans to release the *Fire/EMS Interoperability Study Executive Summary* in December 1998.

Advanced Law Enforcement & Response Technology (ALERT) Vehicle

Under sponsorship of the US Department of Transportation, and with support from the NIJ and the International Association of Chiefs of Police, the Texas Transportation Institute is working to create enhanced law enforcement vehicles. The ALERT vehicle houses a keyboard and a wireless computer with a touch-screen graphical user interface (GUI) for controlling all emergency vehicle peripherals, such as lights, sirens, radar systems, and radios. Data may be exchanged between the vehicle and a centralized database that will transmit information over a radio channel.

The ALERT vehicle provides officers with mobile data terminal capabilities inside and outside the vehicle via the ALERT handheld computer. The handheld computer enables officers to directly enter traffic citations into a database, collect visual and written accident data, consolidate reports and images, upload reports to the base station, review, edit, and print reports at the station, and email reports. The entry of reports directly into the computer via the ALERT vehicle helps reduce paperwork and streamline data collection. Public safety applications beyond typical traffic citations and accident reports are planned. Also planned is a testbed focused on supporting the development of technologies designed to achieve wireless interoperability solutions that integrate into the ALERT platform.

National Crime Information Center (NCIC) 2000

The NCIC was created by the FBI in 1967 to assist criminal justice agencies improve their operations by providing a nationwide information system to support investigations. The system is currently undergoing a major upgrade known as NCIC 2000. The success of NCIC and its increased usage, coupled with technological advances such as mobile data terminals, laptops, and increased capabilities of local, state, and other federal systems, led to the NCIC 2000 initiative.

In addition to current capabilities, NCIC 2000 will provide many additional features. These enhanced features include fingerprint images, enhanced name searches, probation and parole lists, on-line manuals, improved data quality, information linking, mugshots, other images (e.g., vehicles, boats, or vehicle and boat parts), convicted sex offender lists, access to SENTRY (an index of individuals incarcerated in the federal prison system), delayed inquiry, and an on-line ad-hoc inquiry. NCIC 2000 will be available in July 1999 and will meet the following service standards:

- Availability 24 hours a day, seven days a week;

- The ability to process inquiries in two seconds or less;

- The ability to conduct on-line inquiries on information that currently requires special processing; and

- The ability to process image data and transmit images to police cruisers.

The PSWN program will be working in conjunction with the NCIC 2000 to evaluate the feasibility of integrating NCIC 2000 into various mobile data communications systems. This wireless applications test program will assess the reliability and ease of use of the NCIC 2000 hardware and software in different wireless environments.

A Platform for Interoperability

Public Safety Radio Communications
in
San Diego and Imperial Counties

Public Safety Wireless Network (PSWN) Program

A PSWN San Diego Case Study White Paper

April 14, 1998

Introduction

The Purpose: The purpose of this paper is to foster support among senior government decision makers for planning and implementing an interoperable wireless communications network for use in providing public safety services to the citizens of Southern California. This undertaking would build upon the various public safety communications initiatives currently underway in the San Diego/Imperial county region. It could also serve as a precursor to a broader effort addressing public safety communications along the Southwest Border. This paper has been prepared by the Public Safety Wireless Network (PSWN) program, as a part of the PSWN San Diego Case Study. As such, it helps set the stage for addressing the findings of this study.

The Problem: Responding to natural disasters, performing search and rescue efforts, and investigating criminal activity are examples of where public safety agencies at all levels of government need to cooperate and coordinate to achieve common mission objectives. This level of collaboration requires joint communications among a range of agencies and departments. Unfortunately, current wireless communications systems used by public safety organizations are often outdated and incompatible with each other. They do not support the required degree of interoperability. The inability of public safety organizations to effectively communicate with one another in disaster and emergency situations, as well as during routine day-to-day operations, often leads to unsuccessful mission execution, unnecessary risk of human life, and duplicative response efforts. A wireless communications system that properly addresses these interoperability challenges is a necessity.

Part of the Solution: There are a number of on-going initiatives in the San Diego/Imperial county region that are beginning to provide more interoperable wireless communications systems for use by regional public safety officials. Many of these "grass roots" initiatives complement each other in terms of their missions and objectives. Expanded intra- and inter-agency coordination of these individual initiatives may provide an excellent example of good government at work and might serve as a model for other regions in the country to emulate.

Scope: This paper provides information about public safety wireless communications initiatives in the San Diego/Imperial county region. It begins by outlining the shifting radio communications environment; identifying the challenges specific to the San Diego/Imperial county region; and describing the initiatives currently underway in the region. A suggested framework and course of action is then presented to establish a comprehensive interoperable wireless network.

The Shifting Environment

Most public safety wireless communications systems employ outdated technology and do not have the capacity to handle the increasing number of users or the increasing demand for new services, such as mobile data, imagery, and video. Moreover, nearly every public safety agency (local, state, and federal) operates separate wireless networks. Such expensive duplication of effort often precludes the use of spectrally efficient technologies—resulting in less-than-optimal coverage for many agencies—while increasing the technical and administrative overhead required to support these systems. The current wireless communications infrastructure not only

strains scarce resources but also directly impacts mission effectiveness and safety. As public
safety agencies begin to
address this shifting environment, a number of common challenges become apparent. These
include:

- The tightening of budgets at all levels of government.
- The decrease of radio spectrum availability.
- The lack of technical standards that allow the interconnection of different radio
  communications system technologies or of products from different vendors.
- The lack of technical standards for analog and digital radios that allow direct unit-to-unit
  communications.
- The lack of a competitive market for vendor products.

Public safety agencies across the country are struggling to find solutions to these common
challenges. However, each region also has its own local challenges as well.

San Diego/Imperial County Local Challenges

The San Diego/Imperial county region has a high concentration of public safety agencies, a
diverse population density, a higher risk of natural disasters than most regions, and an extensive
international border. These local challenges make the region useful for exploring the obstacles
which make achieving interoperability among various public safety agencies that much more
complex and difficult.

- *High Concentration of Public Safety Agencies:* This region is serviced by more than 180
  public safety agencies that represent all levels of government (local, state, federal, and tribal).
  Such a cross section of public safety agencies provides an excellent opportunity to study the
  numerous challenges of intra- and inter-governmental wireless communications and to
  understand the levels of cooperation needed to create integrated public safety wireless
  communications networks.

- *Diverse Population Densities:* This region encompasses both high-density metropolitan areas
  and sparsely populated rural areas. Designing a wireless communications system to meet
  these variations in population density may result in the consideration of many different types
  of network architectures. This region thus provides a rich environment for learning about the
  relative advantages and disadvantages of alternate architecture concepts.

- *Higher Risk of Natural Disasters:* Southern California has a moderate-to-high risk for natural
  disasters, such as earthquakes, floods, wildfires, and mudslides. These disasters can happen
  without warning and require simultaneous response efforts from all types of public safety
  agencies. During such times, coordination between the numerous public safety agencies is
  critical. Such coordination requirements necessitate a network design that incorporates and
  accommodates flexible capacity needs, to allow for surges in the demand for wireless
  communications.

- *Extensive International Border:* This region has an extensive international border and a
  major port of entry. An integrated interoperable wireless communications network will help

ensure the prudent application of available personnel and equipment resources in addressing issues related to the border.

The need to address these challenges and establish an interoperable wireless public safety network has been recognized by a number of local and state public safety organizations across the country. At the federal level, the National Performance Review (NPR) issued Recommendation IT04, which calls for the planning of a Public Safety Wireless Network (PSWN). In 1997, the NPR, in its *Access America* report, reaffirmed IT04 as A06, and identified specific action items focused on the wireless interoperability problem of local, state, and federal government public safety agencies. These action items, when combined with the challenges described above, have set the stage for building creative local, state, regional, and national solutions in solving the wireless interoperability problem.

Complementary Efforts

At the national level, the PSWN program is acting on the NPR recommendations to gain a broader understanding of the current wireless communications environment. The program is in the process of gathering and analyzing data from various regions around the country. The PSWN San Diego Case Study is part of this effort.

At the local, state, and regional levels, there are similar moves toward altering the radio communications environment. So-called "grassroots" public safety efforts are already pioneering new ways to deliver more capable radio communications services to their users. The initiatives in the San Diego/Imperial county region are representative of these efforts and have established some regional solutions for interoperability.

San Diego/Imperial County Regional Initiatives

There are nine initiatives of interest related to the San Diego/Imperial county region. These are the City of San Diego, the Regional Communications System, the Consolidated Area Radio Trunking System, the Border Tactical Testbed, the California Law Enforcement Mutual Aid Radio System, the Interoperable Computer Aided Dispatch system, the Transportation Management Center, the Western Wireless Emergency Communications System, and the PSWN San Diego Case Study. These initiatives are separate yet cooperative activities that serve adjoining jurisdictions and communications systems. To better illustrate what the initiatives are doing and how they differ and complement each other, the initiatives have been divided into three categories: existing interoperability initiatives, related systems initiatives, and future interoperability initiatives.

The *Existing Interoperability* category refers to initiatives that are currently providing some level of interoperability or are in the implementation stages of such plans. These systems include:

- **The City of San Diego.** The City of San Diego has a trunked/simulcast 800 MHz communications network designed for public safety wireless radio communications. This system has been in operation since 1991 and consists of 18 channels and 7 simulcast transmitter sites, which are all connected via digital microwave. There are 8500+ units

currently operating on the network (public safety, public service, utilities, and school districts). The city plans to expand the system to a full 20-channel network.

- **Regional Communications System (RCS).** The RCS is a trunked 800 MHz regional public safety wireless radio communications network currently under construction. The RCS will serve as the primary wireless voice and data communications link for as many as 85 agencies throughout San Diego and Imperial counties. The RCS intends to expand the program to adjacent areas, such as Orange, Riverside, and other California counties to create an interlocking trunked system for extended interoperability. Currently, a total of 43 separate radio repeater and microwave sites are planned throughout the area to achieve the necessary radio coverage.

- **Consolidated Area Radio Trunking System (CARTS).** This system is a 20 channel single site trunked 400 MHz UHF radio system that has been in operation by the United States Navy since 1991. It is presently being used by approximately 1,800 Navy and Marine personnel and is available for use by other federal agencies. CARTS' mission is to foster the interagency use of the system.

- **Border Tactical (BORTAC)** BORTAC is a low-cost, manually operated "patch panel" for use by local, state, and federal public safety agencies to demonstrate the utility of interoperable communications. The backbone of the CARTS system is used to provide BORTAC capability. The BORTAC has been used in support of multiple activities including high-speed freeway chases, multi-agency truancy sweeps, officer cover, drug sweeps, and Super Bowl events, and more. A second phase for the BORTAC is planned and would include agencies and jurisdictions in Imperial County. Even though it is based on a limited technical approach, the BORTAC has been used significantly enough to substantiate a broader, more comprehensive effort to address the regional interoperability needs of public safety.

- **California Law Enforcement Mutual Aid Radio System (CLEMARS).** CLEMARS is a California Office of Government Emergency Services radio communications initiative that provides 3 channels, two at VHF and one at 800 MHz, for interagency radio communications among state and local users. The objective of the program is to enhance the ability of law enforcement agencies to talk on common frequencies during emergencies. There is statewide interoperability across member agencies with the use of dedicated equipment. A separate, hand-held radio or mobile unit is required to communicate on the CLEMARS channels.

The *Related Systems* category refers to initiatives that streamline traditional public safety communications paths and support systems. These systems include:

- **Interoperable Computer Aided Dispatch (InterCAD).** InterCAD is a messaging system that interconnects computer aided dispatch (CAD) systems. System development is being managed and funded by the U.S. Federal Highway Administration. The system allows public safety dispatchers to share information from one computer screen to another between member agencies. The primary goal of the project is to allow the exchange of incident-related data in near real-time as a way to avoid the reliance on telephone communications during emergency situations. The participating agencies in

Phase I of the project are the San Diego Police Department, the Border Division of the California Highway Patrol, and the San Diego County Sheriff's Department. These agencies are currently using a working system. Phase II and III of the project would expand to include other public safety agencies. Phase III would also link the InterCAD network to the Transportation Management Center.

- **Transportation Management Center (TMC).** The TMC, opened in November 1996, unifies transportation management for the California Department of Transportation (Caltrans) Traffic Operations, for Caltrans Maintenance, and for the California Highway Patrol (CHP) into a centralized center for transportation surveillance and inter-agency communications. The center's primary operational function is 24-hour transportation management on state highways. There are plans to integrate part of the RCS with the TMC. The TMC has also agreed to incorporate the InterCAD system into its facility. These cooperative ventures position the TMC as a possible future command center to direct broader interagency communications.

The *Future Interoperable Systems* category refers to proposed systems, or precursors to such systems, whose implementation are longer-term propositions. Included in this category are:

- **Western Wireless Emergency Communications System (WWECS).** WWECS is a planning entity for communications coordination, initiated by a group of systems managers from Arizona, California, Nevada, and Utah. The group began meeting in June of 1994 to address common issues, including: the digital narrow-banding mandate of the National Telecommunications and Information Administration (NTIA), the lack of compatibility among systems, the persistence of interoperability problems, and the inadequate levels of funding available for system modernization. The effort has evolved into a partnership between close to 100 local, state, and federal agencies. The immediate mission of the organization is to interconnect 28 Department of Defense systems as well as 50+ state and local systems in the WWECS area to build a four-state, regional land mobile radio network for local, state, and federal use.

- **PSWN San Diego Case Study.** This study is part of a national initiative by the PSWN Program Management Office, working in conjunction with the Federal Law Enforcement Wireless Users Group (FLEWUG). Its purpose is to document and analyze challenges to interoperability and other associated communications problems that currently exist in the radio networks that support public safety. The goals of the project are to establish a baseline of information regarding public safety communications in the San Diego/ Imperial county region to identify interoperability needs of the public safety community as a whole, to develop network design improvements, and to perform proof of concept tests. The San Diego Case study will be followed by a companion needs analysis effort for the Southwest Border.

The initiatives in San Diego/Imperial county region, while different in size and scope, have similar end points and stem from a common vision. They are complementary efforts that are on the forefront of solving many of the problems that are common to the larger public safety community. However, there is a need to establish a more comprehensive approach if the challenges are to be met in a timely, effective, and efficient manner.

Plan of Action: Establishing a Public Safety Wireless Utility

1. The first recommended action for unifying these efforts is to establish a San Diego/Imperial County Public Safety Communications Utility. This utility would unify the various disjointed but complementary communications systems and initiatives to provide, in time, an integrated network that crosses jurisdictions and agency lines. This utility would integrate facets of the existing initiatives in the San Diego/Imperial county area into a larger, more comprehensive solution, and could serve as a beginning point for a much broader Southwest Border or western states utility. Member agencies would be able to tap into the resources of the utility as necessary while still maintaining their individual systems. Since agencies already have money in their budgets for individual efforts, pooling resources to partially fund the establishment of the utility with user fees might be an appropriate short-term solution until a more definitive funding plan can be established. Figure 1 illustrates how the initiatives would fit together under the utility concept.
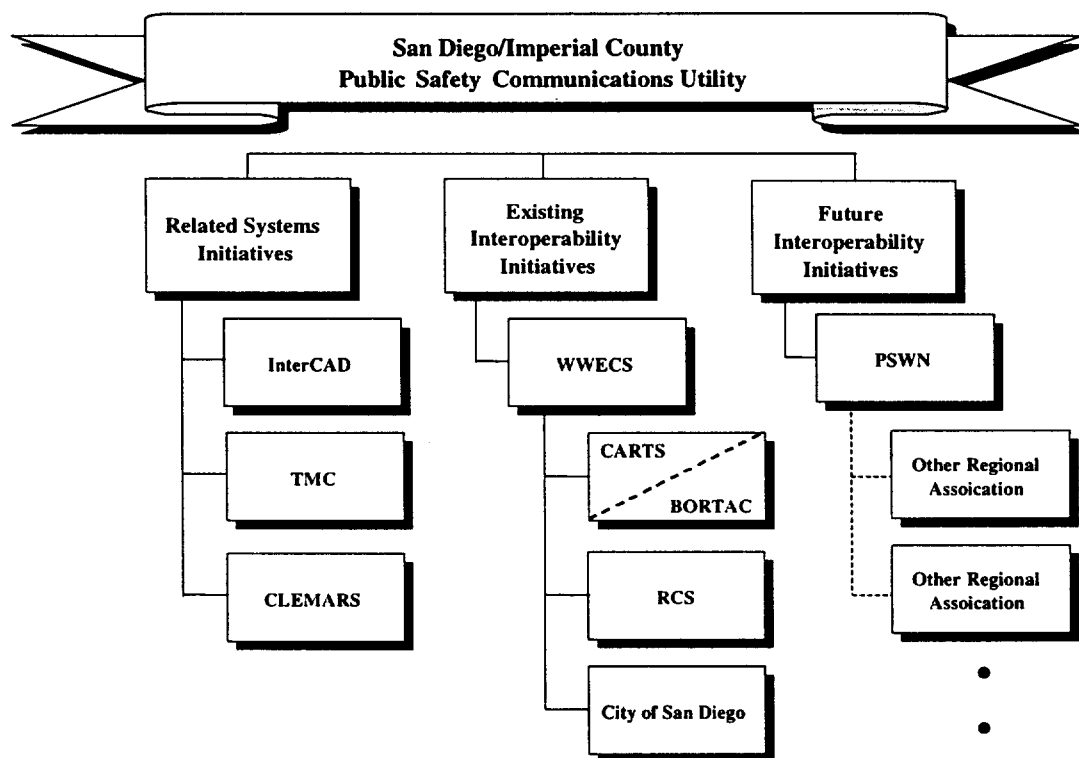
Figure 1: Relating the Initiatives

2. The second recommended action for unifying these efforts is to establish a steering committee to coordinate the process associated with building an interoperable public safety wireless utility. The utility partners could establish an independent entity or make use of an existing one, such as the WWECS, to begin this process. The steering committee must encompass representatives from local, state, and federal agencies to ensure the consideration of diverse points of view. The committee representation must also have sufficient authority to capitalize on the initiatives that are currently underway. The steering committee must be charged with the duties of formulating a comprehensive plan of action consistent with the

general framework for action detailed below. The committee would have discretion to form task forces on particular issues and support areas, and would form the organizational body to coordinate the acquisition, implementation, and management of the unified infrastructure. For this action, the PSWN program, with its national charter, can serve as a clearinghouse of information and as a technical resource for assessing common design challenges and solutions. The PSWN program might also support and advise the steering committee. This interaction would help ensure implementation of the utility in a fashion consistent with the national plan for interoperability currently being developed by the PSWN program.

Framework for Action

For the utility to be successful, its development must proceed under a unified framework for planning and execution. Such a framework provides a method of understanding the full-scale development process of incorporating new technologies into existing infrastructure. There are six basic phases in this framework: 1) Planning, 2) Analysis, which includes design, 3) Prototyping, 4) Acquisition, 5) Installation and Implementation, and 6) Operations and Maintenance. Figure 2 illustrates the full development process.
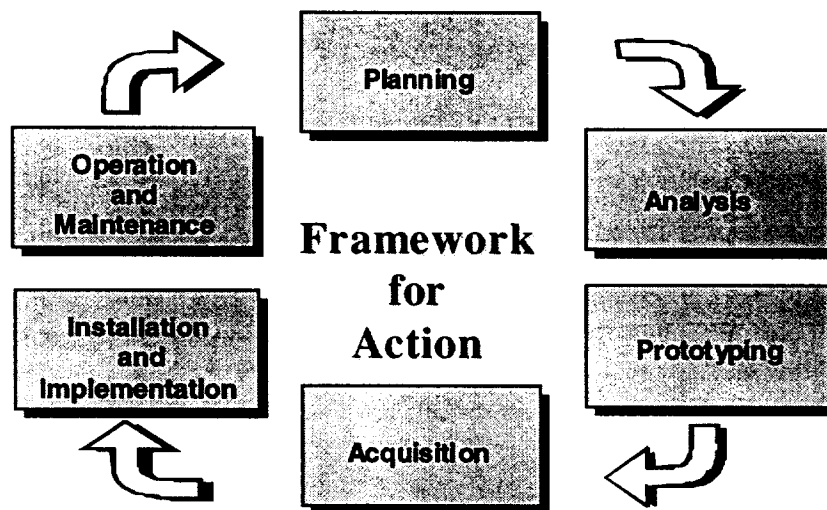
Figure 2
The Full-Scale Development Process

First, system planning is performed in a fashion consistent with a life-cycle management approach. Second, systems-level, functional, and detailed user requirements are developed. Third, designs and prototypes are produced, based on the requirements, to employ technologies and other resources in forming a workable solution. Fourth, infrastructure and materials are purchased. Fifth, installation and implementation of the materials is performed in support of systems integration. Sixth, after the system is operational, the system is maintained and managed to ensure effective performance. Finally, as technology and applications evolve, the process returns to the planning stage to ensure that the necessary system upgrades and improvements are made.

Current Initiatives within the Proposed Framework

As Figure 3 illustrates, each of the San Diego/Imperial county initiatives are already contributing to the different phases of the proposed framework for action to establish a public safety communications utility.

San Diego Initiatives	Planning	Analysis	Prototyping	Acquisition	Installation	Operation
Framework for Action						
City of San Diego	◓	◓	◓	◓	◓	◓
RCS	◓	◓	◓	◓	◓	◓
CARTS	◓	◓	◓	◓	◓	◓
BORTAC	◓	◓	◓	◓	◓	◓
CLEMARS	◓	◓				
InterCAD	◓	◓	◓	◓	◓	◓
TMC	◓	◓				
WWECS	●					
PSWN	●	●	●			

Key

● Major Contribution ◓ Partial Contribution
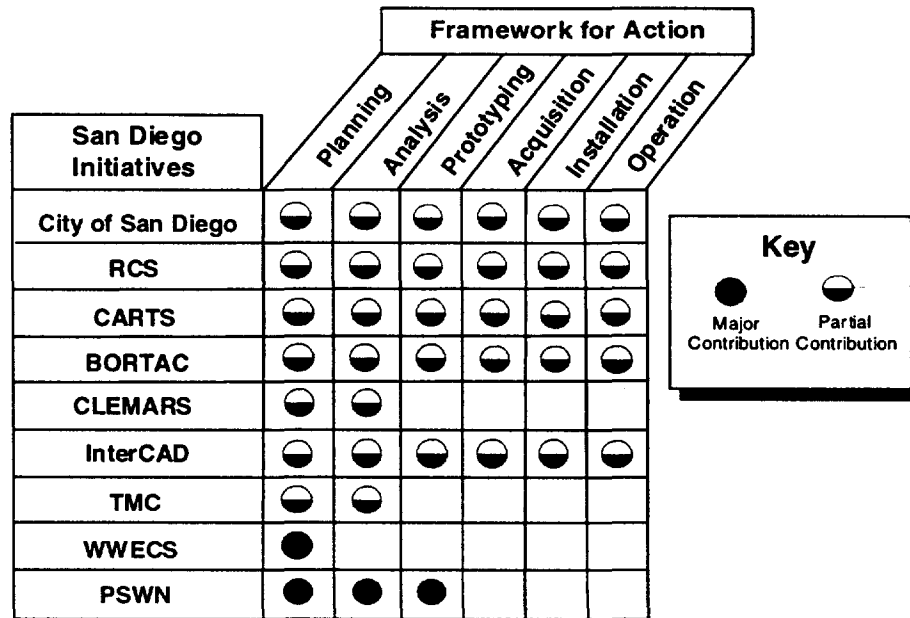
Figure 3
Elements of the Framework Existing Today

The complete and half circles in the chart indicate the degree to which each initiative could contribute to this utility given current resources. The chart demonstrates that one initiative by itself is unable to fulfill each of the phases. Therefore, a broader effort among all of the initiatives is needed. The establishment of the steering committee would begin to bring these efforts together to establish a more comprehensive approach.

The San Diego/Imperial County Region as a Platform for Interoperability

The number of on-going efforts in San Diego/Imperial county region is indicative of the amount of cooperation taking place at all levels of government to tackle the challenges of interoperability. Since these initiatives are also complementary in terms of their objectives they can provide the platform for advancing interoperability on a larger scale. Efforts to modernize and integrate wireless communications systems in this region will provide valuable information about establishing a public safety wireless communications utility and can be a cornerstone for a broader national effort. Only with the necessary funding and authority can this region establish a utility that provides a valuable service and demonstrates good government at work.

> *For more information on the PSWN program,*
> *visit our website at www.pswn.gov*

Report on Funding Mechanisms
for Public Safety Radio Communications
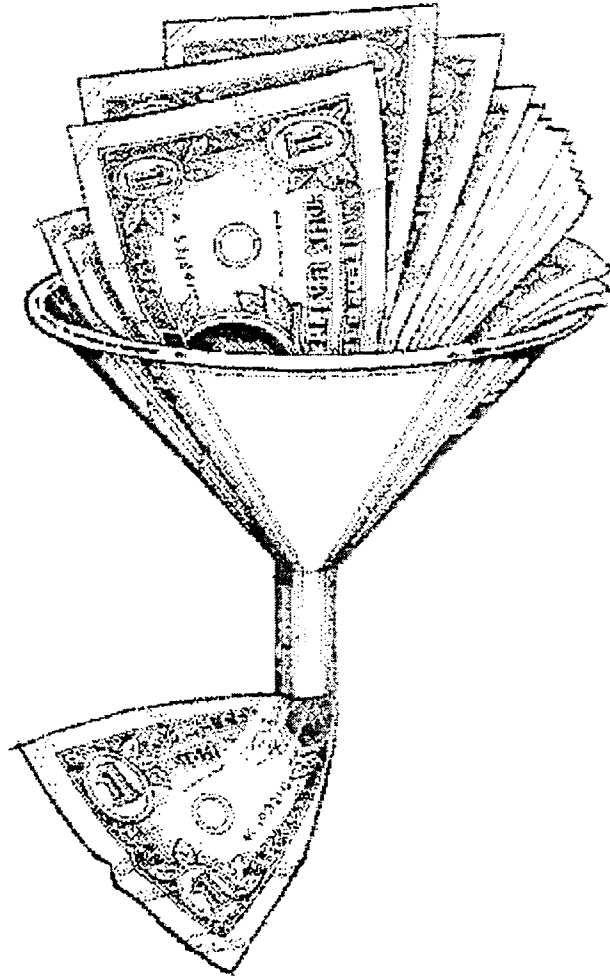
Prepared by Booz · Allen & Hamilton
McLean, Virginia

In Support of the Public Safety Wireless Network (PSWN) Program
Under Contract GS00T969HD0002
Statement of Work # 7

December 17, 1997

FOREWORD

This report provides a framework for understanding the various funding mechanisms that may be of use to the public safety agencies as they endeavor to finance radio communications projects. The report provides a sketch of the funding landscape and is intended to serve as a catalyst for future discussions regarding funding issues.

To make comments regarding the information contained in this document, please contact Kathryn von Forell, Booz·Allen & Hamilton, at 8283 Greensboro Drive, McLean, Virginia, 22102-3838, or by faxing comments to·(703) 902-3465.

EXECUTIVE SUMMARY

Law makers, policy makers, budget and management officers, and users of public safety land mobile radio systems are working independently and together to develop strategies for improving the interoperability, effectiveness, and efficiency of public safety communications. Successful implementation of these strategies will require adequate and consistent sources of funding. Many types of government revenue sources and funding mechanisms are available to and in use by, the public safety community today. However, very few resources are dedicated specifically to land mobile radio communications. Documenting and examining current government revenue resources and funding mechanisms in use by public safety for radio communications, similar communities, and other infrastructure projects should assist the public safety community in tailoring combinations of funding mechanisms suited to federal, state, and local needs.

This report describes government revenue resources and funding mechanisms used in financing public safety and their radio communications projects. The revenue resources and funding mechanisms are categorized by level beginning with the Federal Government, continuing through the state and local levels of government, and finishing with public and private partnerships. Each governmental revenue resource and funding mechanism described is defined and profiled, and some examples of mechanisms in use are provided.

The funding process often begins at the federal level with money directed out of the general revenue fund and either appropriated to federal departments, other governmental entities, agencies, or specific projects, or directly allocated to specific goals via special funds. Federal funding mechanisms are usually tied to a Federal Government or agency guideline or objective and are in forms that include federal budget appropriations, grants, cooperative agreements, and contracts. Most public safety agencies receive federal dollars, either from direct or indirect channels.

Funding administered at the state level is used to fund infrastructure needs of statewide agencies, state objectives and priorities, and local governments. State funds can target public safety needs and offer more flexibility than federal funding. Relevant state funds include special public safety grants or technology and infrastructure funds. Some states have enacted legislation that allows public safety agencies to collect money directly from surcharges such as traffic violations.

Localities receive federal and state funding and also generate revenue unique to their jurisdictions. General revenue funds of the local government's budget and bonds issued for public safety use, surcharges, and fees for service are the primary government funding sources. Funding mechanism options include capital improvement plans and county investment funds among others. The Federal Government and state governments play a role in these processes via guidelines and regulations such as those imposed on federal grants given to localities, and state government limits of local surcharge funding schemes.

The need for more efficient use of spectrum resources and limited governmental budgets is pushing public safety agencies and local governments toward greater cooperation within the public safety community. Other forms of cooperation occur between public and private partnerships. These partnerships are exemplified by public safety agencies working with utility companies, agencies turning to commercial service provision where applicable, the encouragement of private investment, and public safety tapping into privately run foundations and endowments for seed money to initially finance innovative projects.

Some alternative funding mechanisms also are noteworthy. These alternatives include specialized funds, surcharges, fees, foundation money, public and private partnerships, analogous sources targeted for other programs, and the sharing of resources within the community. Alternative sources are becoming more widely sought for new public safety needs. By the authority of the Federal Government, states are now widely imposing fees such as 911 and E911 fees that provide money to finance pubic safety infrastructure. These funds are either administered by the state or, in some cases, by the local municipalities.

At all levels of government, funding for public safety commonly comes from general revenue funds. However, this money is not specifically earmarked for public safety and therefore is not a stable and dependable source for radio communications. Moreover, additional specialized federal and state money sources available to law enforcement needs are not available to the fire and emergency medical services (EMS) side of public safety.

In answer to these funding limitations, this report was created as the first of several documents that will be prepared by the Public Safety Wireless Network (PSWN) program addressing funding for public safety communications. These documents are intended to stimulate an ongoing funding dialogue. By sharing experiences, participants in this dialogue may find creative ways to fund and provide for this critical communications capability. Therefore, insight into additional revenue sources and funding mechanisms are welcomed from the readers of this report.

ACKNOWLEDGEMENTS

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1. INTRODUCTION

The development, deployment, operation, and maintenance of public safety radio communications systems are increasingly an expensive proposition. Public safety agencies at all levels of government—federal, state, and local—are hard pressed to identify government revenue sources that lead directly to public safety funding. From these available revenue sources, identifying feasible funding mechanisms that will funnel money to public safety needs and enable public safety services to keep pace with technological developments and operational needs is even more difficult. Government funding is limited and constrained, and the sources for funding are in competitive demand. Those public safety agencies most likely to be successful in securing necessary funding for their radio systems, will be those who are aware of the majority of viable funding options and who are able to tap into the system to identify and exploit appropriate government revenue resources and funding mechanisms.

1.1   Purpose

This report identifies revenue sources and funding mechanisms that may be appropriate for public safety agencies to finance radio communications needs such as upgrades and maintenance of their land mobile radio communications systems. This report provides an account of prevalent revenue sources and a presentation of an array of funding mechanisms that are available at different levels of government. Figure 1-1 illustrates a few of the revenue sources and mechanisms considered. These sources are commonly used to fund public safety radio communications systems and other like infrastructure projects. Examples that illustrate specific revenues and mechanisms are provided throughout this report.
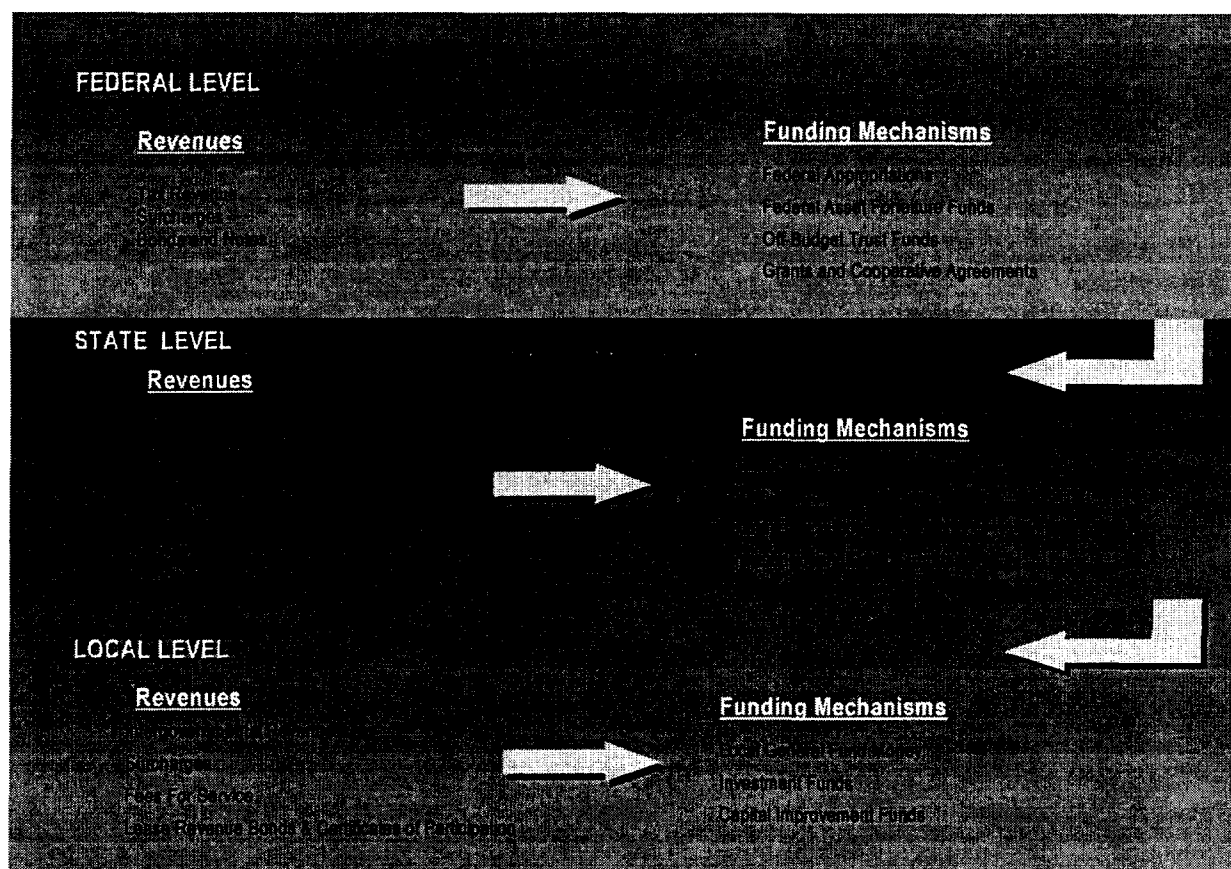
Figure 1-1
Funding Sources at Different Levels of Government

1.2   Background

Public safety communications systems age, missions and operations change and expand, and technology advances. The development of new spectrum-based technologies by the commercial sector has created a highly competitive market for available radio spectrum. Consequently, regulatory agencies are now requiring that users strive for greater spectral efficiency to allow for the best use of this limited resource. Due to the difficulty in obtaining additional radio spectrum, public agencies are more frequently using joint and interoperable systems. As the new commercial services generate large profits and encourage the government to demand more in return for spectrum assignment, public safety's technical advancement and critical information requirements are often overlooked and under funded. Public safety agencies often find themselves pressured to make high-cost efficiency enhancement upgrades to radio communications systems. However, with monetary resources at all levels of government strained, the availability of funding quickly becomes a gating issue for making the requisite improvements. Within these tight fiscal constraints, public safety agencies need funding not only for new and additional antennas, wiring, towers, and other network infrastructure, but also for end-user equipment, such as portable radios, mobile data terminals, and end-user directed services such as training.

This report describes an array of governmental revenue resources and funding mechanisms that public safety agencies may consider using as they work to meet their funding challenges. Public safety agencies at all levels can use this report to help fashion a funding strategy that can meet the common needs of each user community.

1.3   Scope

This report identifies and details government revenue resources and funding mechanisms at various levels of government and highlights joint public and private funding partnerships. Figure 1-2 summarizes these mechanisms. The levels of funding examined in this report are federal, state, local, and public and private partnerships where —

- Federal revenue sources include tax revenues (e.g., property, individual income, corporate income, sales and gross receipts, motor vehicle and operators' licenses, and death and gift taxes), user fees, and bonds and notes. These general fund revenues are used to create federal funding mechanisms, such as direct appropriations, the federal asset forfeiture funds, federal off-budget funds, grants, cooperative agreements, and contracts.

- State revenue sources include revenue from the Federal Government and local governments, federal grant money, sales and gross receipts taxes, income taxes, personal property taxes, corporate income taxes, user fees, surcharges, bonds, notes, and lotteries. State funding mechanisms are in the form of state appropriations, grants, trust funds, and state technology, infrastructure, and capital funds.

- Local revenue sources are federal and state money, taxes, surcharges, fees for service, and lease-purchase financing, bonds, and certificates of participation. Local funding mechanisms include general fund money, county investment funds and lease capital improvement plans.

- Public and private partnerships include shared resources, foundations, endowments, economic development authorities, direct solicitation, fund-raising, corporate donations, private foundations, reduced and shared costs, users and customers, and incentives for private investment.

For a comprehensive list of governmental revenue sources, refer to Appendix B.

Funding Sources for Public Safety Communications

Revenue Mechanism	Source	Government Level	Recipients
Tax Revenues (e.g., income taxes, social insurance, including old-age, survivors, disability, health insurance, unemployment, and corporate income taxes)	Federal	Federal/State/Local	Federal, State, Local
Federal Budget Appropriations	Federal	Federal/State/Local	Federal, State, Local
Federal Asset Forfeiture Funds	Federal	Federal/State/Local	Federal, State, Local
Federal Off-Budget Funds	Federal	Federal	Federal, State, Local
Federal Grants, Cooperative Federal Agreements & Contracts	Federal	State/Local	State, Local
Tax Revenues (e.g., sales and gross receipts taxes, income taxes, personal property taxes, and corporate income taxes)	State	State	State, Local
State User Fees	State	State	State, Local, Local Public Safety
State Bonds	State	State	State, Local
State Lotteries	State	State	State, Local
State Budget Appropriations	State	State	State, Local
State Grants	State	State/Local	State, Local
State Trust Funds	State	State	State
State Technology, Infrastructure, and Capital Funds	State	State	State
Taxes (varies among counties)	Local	Local	Local, Local Public Safety
Surcharges	Local	Local	Local, Local Public Safety
Fee for Service	Local	Local	Local, Local Public Safety
Capital Improvement Plan	Local	Local	Local, Local Public Safety
Local Investment Funds	Local	Local	Local, Local Public Safety
Lease-Purchase Financing Bonds and Certificates of Participation	Local/Local Public Safety	Local	Local, Local Public Safety
Foundations	Private	Private	State, Local, Local Public Safety
Endowments	Private	Private	State, Local, Local Public Safety
Economic Development Authority	State/Local	State/Local	State, Local, Local Public Safety
Direct Solicitation	Local Public Safety	Private	Local Public Safety
Fund Raising	Local Public Safety	Private	Local Public Safety
Corporate Donations	Private	Private	State, Local, Local Public Safety
Reduced and Shared Costs	Local	Local	Local Public Safety
Incentives for Private Investment	State/Local	State/Local/Private	State, Local, Local Public Safety

Legend: Federal, State, Local, Local Public Safety

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Figure 1-2
Funding Revenues and Mechanisms Summary

1.4   Organization

This report is composed of seven sections, including this introduction. The remaining sections are organized as follows:

- Section 2 presents the methodology used to gather data presented in this report.

- Section 3 discusses federal revenues and funding mechanisms.

- Section 4 discusses state revenues and funding mechanisms.

- Section 5 discusses local revenues and funding mechanisms.

- Section 6 discusses public and private partnerships.

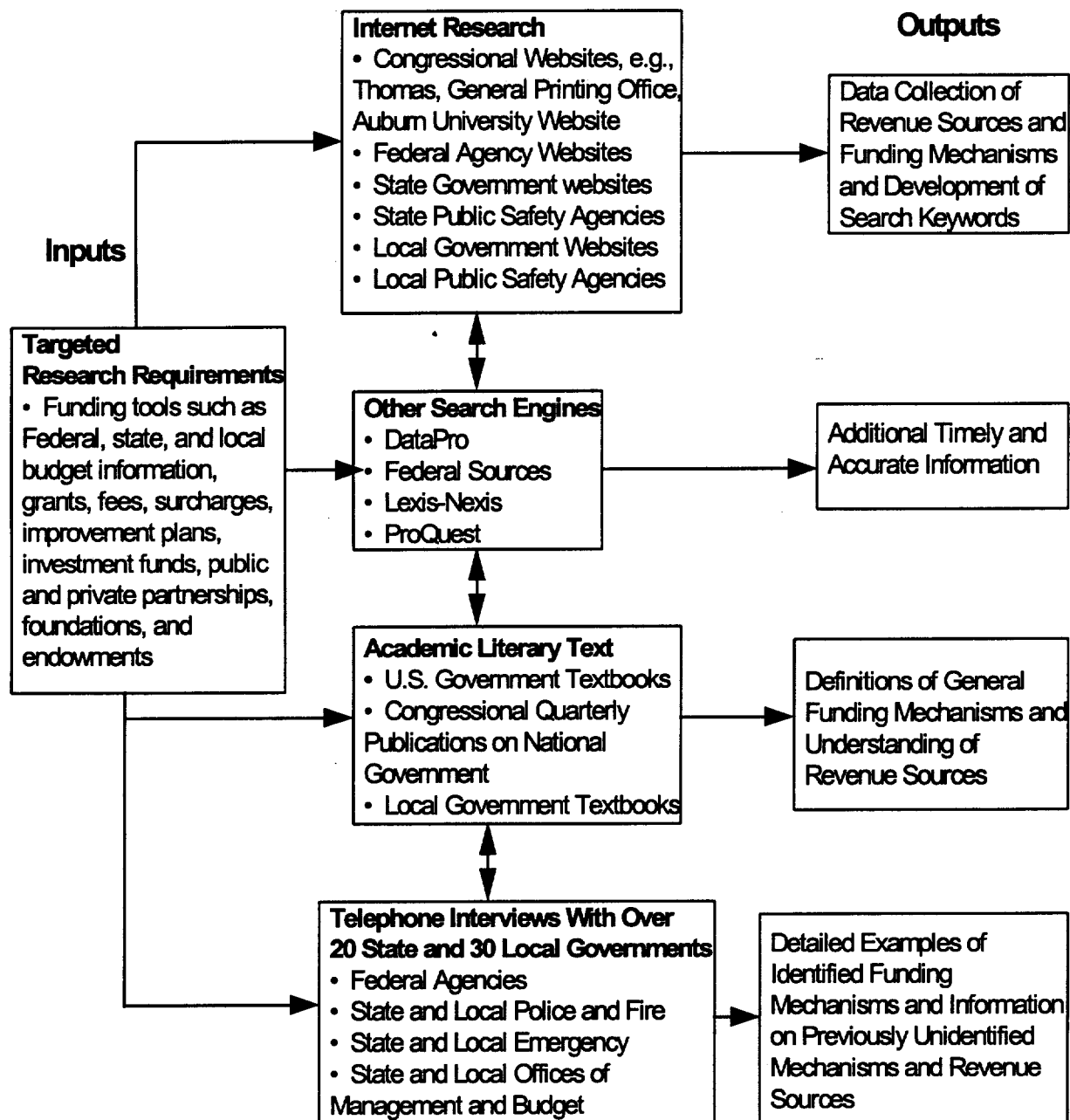- Section 7 provides a brief summary.

2. METHODOLOGY

The methodology employed to develop this report began with a data gathering process that involved researching Federal, state, and local government revenue sources, appropriations processes, budget processes, public safety agencies, grant mechanisms, and other general funding information, largely through scanning government websites on the Internet. Information gathered through Internet research provided both a general framework and specific data on federal and state appropriations, grants, fees, surcharges, and related public safety legislation. Each identified revenue source and funding mechanism was categorized as a federal, state, local, or public and private partnership revenue source or mechanism, depending on where the funding originated and how and where it was used.

Information was refined and augmented through additional data and research using DataPro, ProQuest, Lexis-Nexis, and Federal Sources. The use of various computer-based search engines led to an enhanced framework for categorizing revenue sources and funding mechanisms as federal, state, local, or public and private.

Academic and professional literature also were used to attain specific information (e.g., obtaining formal definitions for certain revenue sources and funding mechanisms) on identified revenue and funding mechanisms. Reference materials included information on the federal budget process and local tax and fee schemes.

Telephone and personal interviews were crucial tools in obtaining detailed examples of researched revenue sources and known funding mechanisms. The interviews also provided information on previously unidentified funding mechanisms. More than 10 states and more than 30 local governments were contacted. The funding administrators for the finance, grants, and budget offices of states and localities were ideal sources of revenue and mechanism information. Additionally, users of the equipment and services, such as the public safety police, fire, and emergency medical services management offices, provided further insight into the most commonly used methods and innovative approaches for filling funding gaps and to getting fledgling initiatives off the planning table. Telephone interviews often necessitated a return to the research process to find corresponding state and local legislation and budget information. Figure 2-1 illustrates the aforementioned processes.

Inputs

Internet Research
- Congressional Websites, e.g., Thomas, General Printing Office, Auburn University Website
- Federal Agency Websites
- State Government websites
- State Public Safety Agencies
- Local Government Websites
- Local Public Safety Agencies

Outputs

Data Collection of Revenue Sources and Funding Mechanisms and Development of Search Keywords

Targeted Research Requirements
- Funding tools such as Federal, state, and local budget information, grants, fees, surcharges, improvement plans, investment funds, public and private partnerships, foundations, and endowments

Other Search Engines
- DataPro
- Federal Sources
- Lexis-Nexis
- ProQuest

Additional Timely and Accurate Information

Academic Literary Text
- U.S. Government Textbooks
- Congressional Quarterly Publications on National Government
- Local Government Textbooks

Definitions of General Funding Mechanisms and Understanding of Revenue Sources

Telephone Interviews With Over 20 State and 30 Local Governments
- Federal Agencies
- State and Local Police and Fire
- State and Local Emergency
- State and Local Offices of Management and Budget

Detailed Examples of Identified Funding Mechanisms and Information on Previously Unidentified Mechanisms and Revenue Sources

Figure 2-1
Research Methodology

3.   FEDERAL FUNDING SOURCES

This section presents information regarding federal revenue resources and funding mechanisms of potential interest to state and local public safety agencies. The Federal Government's revenue resources are derived mainly from federal taxes, user fees, and bonds and notes held by the Federal Reserve System. Programs that fulfill nationwide Federal Government guidelines and requirements have access to federal revenue, via the Federal budget, usually through direct, legislatively authorized appropriations. However, many federally endorsed objectives also are funded through other budget mechanisms, such as grants and cooperative agreements that may require successful completion of a competitive process sponsored by a specific federal agency. Although this section is not a comprehensive treatment of revenues and mechanisms, it does include those most frequently used by public safety providers. For additional information on the federal budget process and on some of the federal funding mechanisms refer to the federal budget section in Appendix B.

Tax Revenue

Off-Budget Trust Funds

Federal Government

Federal Grants

Bond and Note Revenue

Federal Appropriations

User Fees & Surcharges
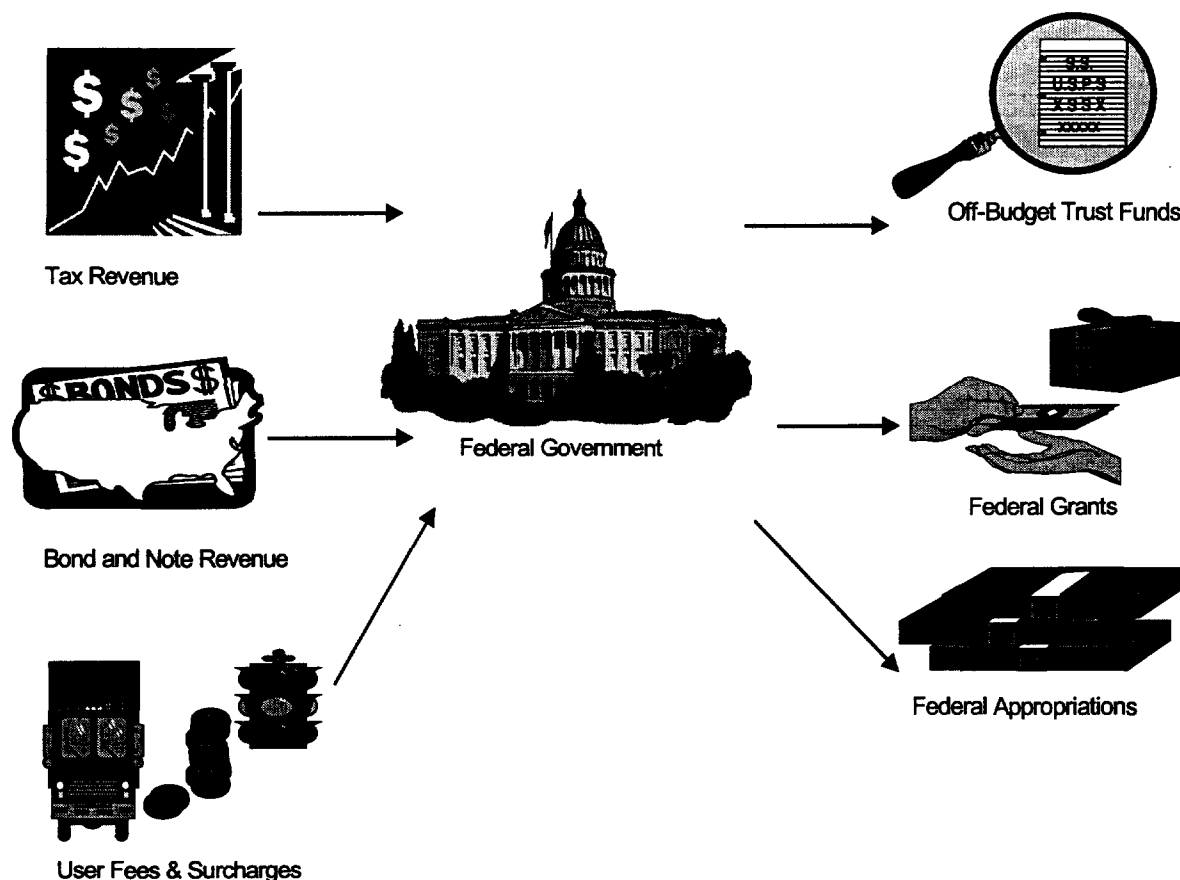
Figure 3-1
Federal Funding Sources

3.1   Federal Tax Revenues

The Federal Government furnishes its general fund primarily with tax and bond and note revenues. The predominant taxes are on property, individual income, corporate income, sales

and gross receipts and excise taxes (e.g., customs duties, motor fuel, alcoholic beverage and tobacco i.e., sin taxes, ozone depletion, and taxes on public utilities), motor vehicle and operators' licenses fees, and death and gift charges. Federal taxes usually go into the federal general fund, however, certain taxes, such as taxes on motor fuel, are funneled into trust funds that set aside revenues for particular purposes or programs, such as the Highway Trust Fund.

3.2   Federal User Fees

The Federal Government also generates revenues by imposing user fees on benefits and actions that incur costs for society. There are four types of user fees: [1]

- A fee is levied on individuals and businesses for goods and services provided by the government and obtained voluntarily. Such fees are imposed on highway, waterway, federal lands or facilities, postal, deposit, and Medicare uses.

- Regulatory fees are levied on businesses or activities that are subject to regulation. For example, copyright, patents, and licenses require a user fee.

- Benefit-based user fees are imposed on consumers of federally provided goods and services, such as highway and waterway tolls, tires, and trucks.

- Liability-based fees are collected from activities to compensate for damage to the environment and other interests. Liability-based fees resemble taxes and are dedicated to trust funds established to eliminate the damage or to compensate for injury. For example, fees are imposed on coal mining to compensate miners suffering from black lung disease and on crude oil to finance the cleanup of oil spills.

Federal law requires that user fees should be fair and equitable and should account for the public policy or interest served.

3.3   Federal Funding Mechanisms

Federal funding mechanisms transfer federal revenues to the states and to federal and state agencies and departments. Federal mechanisms forward national interests and help advance national policy goals for the citizenry. These mechanisms also help to meet otherwise unfulfilled needs.

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[1] Allen Schick, *The Federal Budget: Politics, Policy, Process,* Washington, D.C: The Brookings Institution, 1995.

3.3.1 Federal Budget Appropriations

Federal appropriations[2,3,4] are significant sources of potential funding. A federal budget appropriation is a sum of money allocated from the federal budget to fund a congressionally authorized project. Appropriated funds are used to advance a broad range of nationally endorsed government programs. Federal Government direct appropriations can be a source of funding for public safety communications needs.

If funding is to be provided through the federal budget appropriations process, contact with the executive branch must commence at least 1 year before the time that the appropriated money is needed. This is because the executive branch develops its budget 2 years before the related fiscal year begins. Figure 3-2 illustrates the 2 year budget cycle.
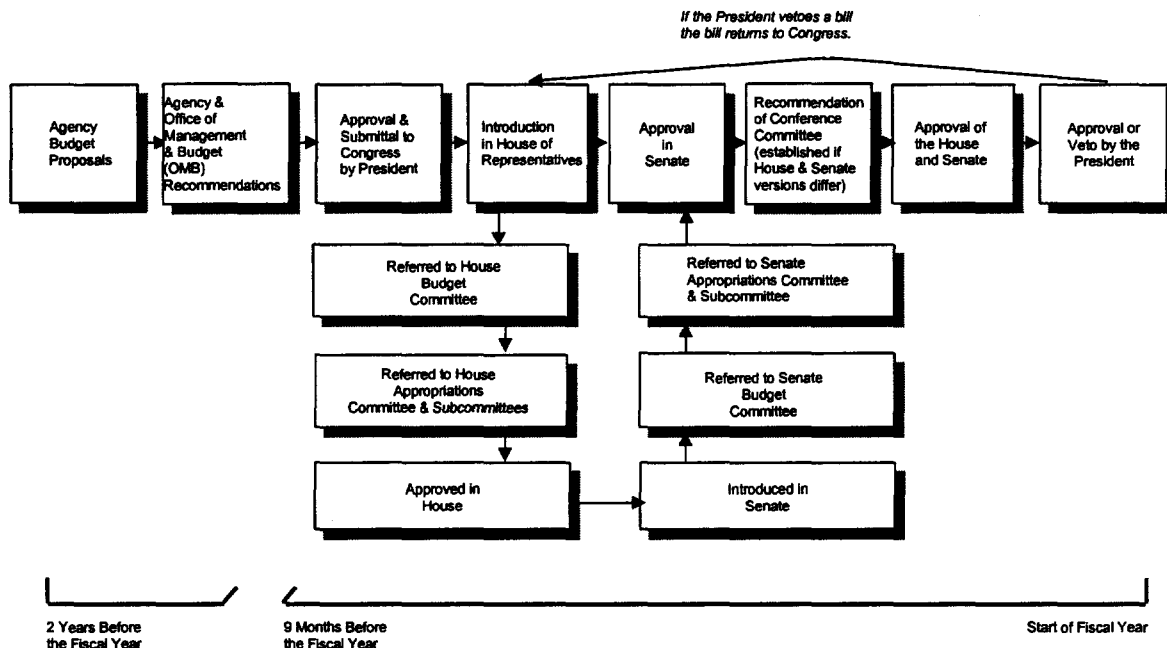
Figure 3-2
The Federal Budget Process

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[2] John L. Mikesell, *Fiscal Administration: Analysis and Applications for the Public Sector*, 4th edition, New York: Harcourt Brace Publishers, 1995.

[3] Roger H. Davidson and Walter J. Oleszek, *Congress and Its Members*, 3rd edition, Washington, DC: Congressional Quarterly, Inc., 1990.

[4] Office of Management and Budget (OMB), *Analytical Perspectives, Budget of the United States Government, Fiscal Year 1998*, Washington, DC: OMB 1997. Office of Management and Budget Homepage, #http://frwebgate2.access.gpo.gov/cgbin/waisgate.cgi?WAISdocIS=158789+1+0+0&WAILaction+retrieve.

3.3.1.1 Obtaining Federal Appropriations. To obtain appropriations from the federal budget, an advocate such as an executive branch official requests that a program be authorized for creation or continuation. The requirements for the program or action are introduced in an authorizing piece of legislation. After the authorization request has been championed for inclusion in a bill, or becomes a bill of its own, the bill is then lobbied for and against by local citizen groups, industry, state and local governments, and other interest groups. Should the authorization language be adopted and passed as its own bill or in another bill, the measure would then need to have funds designated for the action or program via an appropriations bill, which is also the subject of lobbying efforts.

3.3.1.2 Federal Grants and Cooperative Agreements.[5] Grants and cooperative agreements shift spending authority from one level of government to another. Grants and cooperative agreements receive their revenue from their departments appropriated budget money, which is received from the federal general revenue pool. The Federal Government issues a grant or cooperative agreement with a state or local government to fulfill a federal objective in partnership with the state or local government. The Office of Management and Budget (OMB) assists the Federal Government with establishing consistency and uniformity among federal agencies in the management of grants and cooperative agreements with state, local, and federally recognized Indian tribal governments. Generally, grants are suitable when less federal oversight of a project is in order, while cooperative agreements are used when "substantial involvement is expected between the executive agency and the state, local government, or other recipient when carrying out the activity contemplated in the agreement."

Two types of grants, categorical and block, are available. Categorical grants provide assistance for specific and narrowly defined purposes, usually limited to spending for certain activities. Block grants are usually distributed according to a statutory formula to finance activities in a broad area. The Safe Street Grant, for example, is a block grant that established a broad assistance program for crime prevention and the administration of justice. Descriptions of specific types of grant programs follow.

Community Oriented Policing Services More (COPS MORE) Grant.[6,7,8] The COPS MORE Grant is a component of the COPS Grant that resulted from the 1994 Anti-Crime Law. The 1994 Anti-Crime Law was designed to increase the deployment of law enforcement officers devoted to community policing nationwide. COPS' grants provide funding to cities and towns for hiring additional law enforcement officers. COPS MORE grants provide supplemental funding to purchase equipment and technology, to procure support resources, and to pay overtime.

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[5] OMB, *Grants and Cooperative Agreements With State and Local Governments*, Washington, DC: 1997. URL: #http://www.whitehouse.gov/WH/EOP/OMB/html/circular.html.

[6] DoJ, Office of Justice Programs, Bureau of Justice Assistance, COPS Universal Hiring Grant, Washington, DC: DoJ 1996.

[7] Janet Quist, "Senate Funds Local Law Enforcement Block Grant," Nation's Cities Weekly August, 4, 1997.

[8] Becky Smith, Department of Justice COPS Office, telephone interview with Haynee Kang, August 8, 1997.

These grants are given to accommodate up to 75 percent of the cost of the equipment, technology, civilian salaries, or overtime for 1 year. However, agencies receiving grants are required to provide a minimum local dollar match of 15 percent. Waivers of the local match requirement are given only in cases of extreme fiscal hardship. Some innovative sources for meeting the local match requirement are: asset forfeiture funds, housing and community development funds, state funds, private funds, and Bureau of Indian Affairs funds. COPS Grant advisors are in each state with separate advisors for New York City, Los Angeles, and Chicago.

The House Commerce, Justice, and State Departments Appropriations Committee approved $1.4 billion to continue the COPS Grant in FY98. However, in some areas, such as Washington, DC, the COPS MORE Grant has been incorporated into the Local Law Enforcement Block Grant, which is described later in this section.

Edward Byrne Memorial State and Local Law Enforcement Assistance.[9] The Edward Byrne Memorial State and Local Law Enforcement Assistance Program was created under the Anti-Drug Abuse Act of 1988 to provide funds to assist states and local governments in conducting programs that offered a high probability of improving the functioning of the criminal justice system and of enhancing drug control efforts at the state and local levels. The Byrne program emphasizes nationwide and multi-jurisdictional projects and programs that address the drug problem and advance national drug control priorities.

The Byrne Grant must address one of the following five areas: community-based programs, which include community policing, community mobilization, and comprehensive approaches to assisting communities; crime and violence prevention, especially efforts that are interdisciplinary and interagency; violence reduction programs that target violent offenders, criminal gangs, firearms trafficking, domestic violence, and other crimes of violence against women for aggressive investigation and prosecution; alternative dispositional approaches, including drug courts, innovative intermediate sanctions, drug treatment for incarcerated offenders, elimination of certain mandatory sentences for first-time offenders, and appropriate sentences for repeat and violent offenders; and intergovernmental coordination initiatives related to the coordination with federal law enforcement and U.S. Attorneys' initiatives against drugs and violent crime.

Grants may provide personnel, equipment, training, technical assistance, and information systems for more widespread apprehension, prosecution, adjudication, detention, and rehabilitation. Grants also may be used for multi-jurisdictional task force programs that integrate federal, state, and local drug law enforcement agencies and prosecutors for the purpose of enhancing interagency coordination and intelligence and facilitating multi-jurisdictional investigations.

Each state receives a base amount of 0.15 percent of the total formula allocation, with the remaining funds allocated based on each state's relative share of the total population. The chief

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[9] DoJ, Office of Justice Programs, Bureau of Justice Assistance, *Bureau of Justice Assistance Fact Sheet: Edward Byrne Memorial State and Local Law Enforcement Assistance*, Washington, DC: DoJ 1997.

executive of each state has a designated state office to administer and coordinate the distribution of funds. The requirements and designated uses of grants from the Byrne program include the following:[10]

- **Administrative Funds** A maximum of 10 percent of the formula grant funds allocated to a state may be used to pay for costs incurred in administering the Formula Grant Program.

- **Matching Requirements** At least 15 percent of the cost of a program or project funded must be paid by nonfederal funds, which shall be in cash.

- **Pass-Through** Local units of government shall receive a share of the state's funds proportional to the local unit's expenditures relative to the state's expenditures.

- **Period of Project Support** Projects will be funded for a maximum of 4 aggregate years. The exception is grants awarded to state and local governments to participate in multi-jurisdictional drug task forces, victim assistance programs, and multi-jurisdictional gang task forces.

- **Construction** Grant funds may be used only to construct penal and correctional institutions. Property may not be acquired with grant funds.

- **Statewide Strategy** Each state is required to develop a statewide strategy to improve the functioning of the criminal justice system, with an emphasis on drug trafficking, violent crime, and serious offenders.

Federal Emergency Management Agency Grants. The Federal Emergency Management Agency (FEMA) is an independent government agency that reports to the President. Its central mission is to "reduce the loss of life and property and to protect our nation's infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery." FEMA provides grants, specialized services, and advisory and counseling services to assist state and local agencies in developing a network of statewide emergency management systems. These systems provide the capacity for state and local government to coordinate emergency operations within the state and in coordination with other states and the Federal Government.

FEMA grants can be used for planning, design, construction, maintenance, and replacement costs for facilities and equipment used for emergency management purposes, including emergency operating centers, emergency communications systems, emergency warning systems, and emergency features for the Emergency Broadcast System (EBS) at designated radio stations. Funds may not be used for capabilities facilitating daily activities.

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[10] Allen Schick, The Federal Budget Politics, Policy, Process. Washington: Brookings Institution, 1995.

State governments are eligible for funding. Local governments must apply for funding through the state government. FEMA grants require a 50 percent state or local match of funds. According to the 1998 Budget, FEMA was appropriated $116 million in 1996, $131 million in 1997, and $118 million in 1998 from the Federal budget for FEMA grants.

Local Law Enforcement Block Grants.[11,12,13] The Senate appropriated nearly $500 million for the implementation of the Local Law Enforcement Block Grant (LLEBG) program to be administered by the Bureau of Justice Assistance (BJA) in Fiscal Year (FY) 1998. The BJA is expecting comparable funding for FY99. The LLEBG provides funding for local government to sustain current and future projects needed to reduce crime and improve public safety.

The LLEBG program funds must be used for one or more of the following six purpose areas:

- Providing law enforcement support for hiring, training, employing new law enforcement officers, and paying overtime to law enforcement officers

- Procuring equipment technology and other material directly related to basic law enforcement functions

- Enhancing security measures in and surrounding schools

- Establishing or supporting drug courts

- Establishing crime prevention programs involving cooperation between community residents and law enforcement personnel to control, detect, or investigate crime or to prosecute criminals

- Defraying the cost of indemnification insurance for law enforcement officers.

LLEBG funds cannot be used to purchase, lease, rent, or acquire any vehicle not used primarily for law enforcement to retain consultants, to construct new facilities, or to supplant state or local funds. LLEBG funds must increase the amount of funds that would be available through state and local sources. LLEBG funds cannot exceed 90 percent of the total program costs and participation requires a cash match that cannot be waived. LLEBG funds are a flexible way to address a broad range of public safety concerns. Additionally, with this program local leaders are able to prioritize their local public safety needs based on a broad list of allowable uses.

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[11] DoJ, Office of Justice Programs, Bureau of Justice Assistance, *Bureau of Justice Assistance Fact Sheet: FY 1997 Local Law Enforcement Block Grants Program*, Washington, DC: 1997.

[12] Ibid.

[13] Janet Quist, "Cities Need to Know How to Apply for Law Enforcement Block Grant Funds," *Nation's Cities Weekly* May 27, 1997: vol. 19.

The Director of BJA sets aside funds for local entities within a state. The size of the grant is proportionate to the state's average annual number of violent crimes compared with the number for all states for the three most recent calendar years of Federal Bureau of Investigation (FBI) data. Each state receives the minimum award of 0.15 percent of the total amount available for formula distribution under the LLEBG program. Awards to local government are proportionate to each local jurisdiction's average annual number of violent crimes to the number for all local jurisdictions in the state for the three most recent calendar years. The BJA directly awards to local governments when the award amount is at least $10,000. Each state receives the remainder of its allocation for local applicants whose award amounts are at least $10,000. The BJA will make one aggregate award directly to the state for these items. The state, in turn, distributes these funds to state police departments that provide law enforcement services to local governments or to local governments that receive less than $10,000. All funds must be used to reduce crime and improve public safety.

Each LLEBG recipient must establish a trust fund for the program funds to accrue interest. All federal funds that are not used within 1 year of the initial award date must be returned within 90 days of project termination.

National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce Grants.[14,15] The Department of Commerce (DoC) provides money to state agencies and other parties to promote scientific and technical research through grant programs. The NTIA, as an agency of the DoC, provides grants for telecommunications research activities related directly to the development of a national information infrastructure. These funds may be used for planning and constructing telecommunications networks dedicated to the provision of education, culture, health, public information, public safety, and other social services. For example, NTIA issued $16 million in 1996, $19 million in 1997, and $33 million in 1998 in NTIA grants.[16]

An example of an NTIA grant is the Telecommunications and Information Infrastructure Assistance Program (TIIAP). Funding under the TIIAP is awarded to support projects that improve the quality and promote responsiveness of public safety and foster communications within communities, both urban and rural. TIIAP will not fund one-way networks, single organization projects, content development projects, hardware or software development, training projects, or construction. State and local governments, nonprofit health care and public health providers, school districts, libraries, universities and colleges, public safety services, community-based organizations and other nonprofit entities are eligible. TIIAP will provide up to 50 percent of the total project costs unless extraordinary circumstances warrant a grant of up to 75 percent, and the grantee must match the grant with a cash contribution or with in-kind services. Awards usually range from $5,000 to $1.7 million. A project will not be considered eligible for a grant

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[14] *NTIA, Telecommunications and Information Infrastructure Assistance Program (TIIAP),* Washington, DC: 1997, NTIA Homepage, #http://www.ntia.doc.gov/otiahome/tiiap/tiiapfact.htm.

[15] Phillip English, "The Telecommunication and Information Infrastructure Assistance Program," presentation at APCO Conference, August 11, 1997.

[16] 46 U.S.C 391, 392.

unless the applicant can demonstrate the capacity to supply matching funds and to sustain the project beyond the award period.

State and Community Highway Safety Grants (Administered by the Department of Transportation).[17] The Department of Transportation issues grants to provide a coordinated national highway safety program that aims to reduce traffic accidents, deaths, injuries, and property damage. Formula grant funds may be used for problems identified within the following nine national priority program areas of: alcohol and other drug countermeasures, police traffic services, occupant protection, traffic records, emergency medical services, motorcycle safety, pedestrian/bicycle safety, speed control and roadway safety, and pupil transportation safety. States, federally recognized Indian tribes, the District of Columbia, Puerto Rico, American Samoa, Guam, Northern Marianas, and the Virgin Islands are all eligible for these grants.

To apply, the state must submit a highway safety plan addressing state and community highway safety activities for the following year to the National Highway Traffic Safety Administration (NHTSA) regional offices and to the Federal Highway Administration (FHA) division offices. Formula and matching requirements include 75 percent apportioned on the total resident population; 15 percent apportioned against public road mileage in states; and the Federal share will not exceed 80 percent. The average assistance ranges from $600,000 to $9,400,000.

3.3.2 Federal Trust Funds

Federal trust funds contain tax and user fee revenue that is earmarked for specific purposes or programs. Most of the more than 160 trust funds are small; however, the eight largest trust funds account for 97 percent of total trust fund revenue. Laws that designated them as trust funds also established social security, highways, airways, and other large trust funds. Many smaller trust funds were created pursuant to an agreement between a government agency and a donor. When a trust fund is created it does not become permanent, therefore, trust funds influence federal budgetary outcomes. The groups that rally to create a trust fund can easily monitor the budget to ensure the livelihood of the trust fund. In 1996, the federal budget supported the following major trust funds: airport and airway, federal employees retirement, federal old-age, survivors and disability insurance, foreign military sales, health insurance, transportation, federal employees health benefits, military retirement, unemployment, and veterans life. [18]

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[17] GSA, *State and Community Highway Safety,* Washington, DC: 1997, URL: #http://gsacentral.gsa.gov/cgi-bin/waisgate?WAISconnType=&WAISdocID=1585228154+0+0+0&WAISaction=retrieve.

[18] Allen Schick, *The Federal Budget: Politics, Policy, Process,* Washington, D.C.: 1995, The Brookings Institution.

3.3.3 Federal Asset Forfeiture Funds[19,20]

Asset forfeiture programs have become an integral tool in fighting crime. They provide significant revenues to fund law enforcement efforts, resulting in increased effectiveness of law enforcement agencies. The Comprehensive Crime Control Act of 1984 modernized the system of asset forfeiture by creating a uniform program to manage revenue from forfeited currency and property. Today, two asset forfeiture funds exist at the federal level: the Department of Justice Asset Forfeiture Fund and the Department of the Treasury (TREAS) Forfeiture Fund.

Asset forfeiture funds are composed of administrative and judicial forfeitures that result from violations of federal law. The Comprehensive Crime Control Act authorizes the equitable sharing of federally forfeited proceeds with state and local law enforcement agencies that contributed to the investigation that led to the forfeiture. This stipulation has promoted cooperation among law enforcement agencies as they combat criminal activity. Similarly, the Federal Government's leading role in promoting law enforcement cooperation through asset sharing has served as a model for state, local, and foreign governments.

The Department of Justice Assets Forfeiture Fund was established in accordance with the provisions of Title 18 United States Code (U.S.C.) Section 514C. Six agencies are involved in the seizure of forfeited property under the Department of Justice Assets Forfeiture Fund: the Drug Enforcement Agency (DEA), the FBI, the Immigration and Naturalization Service (INS), the U.S. Postal Inspections Service (USPIS) of the U.S. Postal Service, the U.S. Park Police (USPP) of the Department of the Interior, and the Office of Criminal Investigations of the Food and Drug Administration (FDA).

The Executive Office of Asset Forfeiture, located within the Department of Justice (DoJ), manages the program. Since 1985, more than $3.8 billion in forfeitures have been deposited into the Asset Forfeiture Fund, which is an account maintained within the U.S. Department of the Treasury. Forfeited proceeds in FY94 totaled $549.9 million and were used to provide financial support to the law enforcement community.

The Attorney-General has the authority to share fund revenue with state, local, and foreign law enforcement agencies for their assistance in successful forfeiture cases. In FY94, $134.6 million in forfeited cash and $7.3 million in forfeited property were shared with state and local enforcement agencies. Table 3–1 shows the DoJ Asset Forfeiture Fund's expenses and distributions for FY94.

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[19] U.S. Department of the Treasury (TREAS), Executive Office for Asset Forfeiture, Office of the Under Secretary, Treasury Forfeiture Fund: Annual Report Fiscal Year 1995," Washington, DC: TREAS 1996.

[20] U.S. Department of Justice (DoJ), Asset Forfeiture Office Criminal Division and the Asset Forfeiture Management Staff Justice Management Division, *Annual Report of the Department of Justice Asset Forfeiture Program: Fiscal Year 1994*, Washington, DC: DOJ 1995.

As an example of localities benefiting from forfeiture funds, the police in Florida's West Palm Beach have used the money to purchase upgraded computer systems for the department and to augment the police budget for other expenditures.[21,22] San Diego received $750,000 in FY97 and plans to receive the same amount in FY98. The State of New York is investigating the concept of using asset forfeiture funds to aid in the financing of a statewide police wireless radio system.[23]

Table 3-1
DoJ Asset Forfeiture Fund's Expenses and Distributions FY94 (in millions)

Equitable Sharing	$134.63
Federal Investigative and Program Expenses	$131.19
Forfeiture Related Business Expenses	$103.04
Transfers of Forfeited Property	$11.74
Transfer to INS	$1.75

The Department of the Treasury Forfeiture Fund was established in accordance with the Treasury Forfeiture Act of 1991, Title 31 USC Section 9703. Members of the Treasury Forfeiture Fund include: the Internal Revenue Service (IRS), the United States Secret Service (USSS), the Bureau of Alcohol, Tobacco and Firearms (ATF), the U.S. Customs Service, and the U.S. Coast Guard (USCG).

The revenue sources for the fund include currency and monetary instruments; forfeited property; payments in lieu of forfeiture; and interest from special Treasury securities. Table 3-2 shows revenue and financing sources (in millions) for FY95.

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[21] TREAS. Executive Office for Asset Forfeiture, Office of the Under Secretary (Enforcement), *Treasury Forfeiture Fund: Annual Report Fiscal Year 1995*, Washington, DC: TREAS 1996.

[22] Mike Perez, DoJ Justice Management Division, Asset Forfeiture Management Staff, interview with Tim McEnery, September 3, 1997.

[23] Mary Beth Woods, New York State Capitol, Division of the Budget, Associate Budget Examiner, telephone interview with Tim McEnery, September 8, 1997.

Table 3-2
Revenue and Financing Sources FY95 (in millions)

Forfeited Currency and Monetary Instruments	$146
Forfeited Property	$75
Other	$17
Interest	$7
Payments in Lieu of Forfeiture	$7

The Treasury's Executive Office for Asset Forfeiture administers the fund. Fund revenues are distributed to one of four different entities: state and local agencies, victim restitution, other federal agencies, and foreign countries. Table 3-3 details the allocation of revenue for FY95.

Table 3-3
Allocation of Revenue FY95 (in millions)

State and Local Agencies	$58
Victim Restitution	$39
Other Federal Agencies	$8
Foreign Countries	$7

Examples of Treasury Fund revenue benefiting the public safety community—within the area of information technology—include the provision of funds for the ATF cease-fire technology, which is a sophisticated computerized system that inventories, identifies, and matches bullet projectiles and the acquisition of recent database enhancements at ATF's National Firearms Tracing Center.

3.3.4 Federal Off-Budget Funds[24,25,26]

Since 1969, the unified budget concept has been used by the Federal Government as the foundation for its budgetary analysis and presentation. This concept, developed by the President's Commission on Budget Concepts in 1967, requires the budget to include all Federal Government programs and the fiscal transactions of these programs. Most of the agencies abided

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[24] OMB, *Analytical Perspective, Budget of the United States Government*, Washington, DC: OMB 1997. GPO Homepage, #http://frwebgate2.access.gpo.gov/cgi-bin/waisgate.cgi?WAISdocID=132844094+7+0+0&WAISaction=retrieve.

[25] Doug Norwood, Office of Management and Budget, Division of Budget Analysis, Fiscal Economist, telephone interview with Tim McEnery, August 26, 1997.

[26] David Koitz, *Social Security's Treatment Under the Federal Budget: A Summary*, CRS Report for Congress No. 95-206 EPW, Washington, DC 1995.

by this new procedure. However, a few agencies preferred to maintain more control over their operations and deviated from the plan.

Therefore, in 1971, the practice of keeping certain federal program's, office's, or an agency's funds off-budget began. Off-budget funds are congressionally imposed taxes and payments, "withheld" from the federal budget's general revenue fund, used to pay for various services and specific projects.

Two entities with portions of their budgets in off-budget funds are the Social Security Administration and the United States Postal Service. Social Security, which was removed from the budget in 1985, has two social security trust funds that are off-budget: old-age and survivors insurance, and disability insurance. The Postal Service's fund was removed from the Federal General Revenue Fund in 1989.

4. STATE FUNDING SOURCES

Like the Federal Government, state governments support the development, deployment, and maintenance of public infrastructure projects, such as public safety radio communications, through a variety of funding mechanisms. Often, state funds complement those provided by the Federal Government.

State-collected revenues are used to fund the infrastructure needs of statewide agencies. They are also used to finance, in whole or in part, the infrastructure requirements of local governments. The options presented herein are not exhaustive but do provide a good overall picture of commonly used money sources.
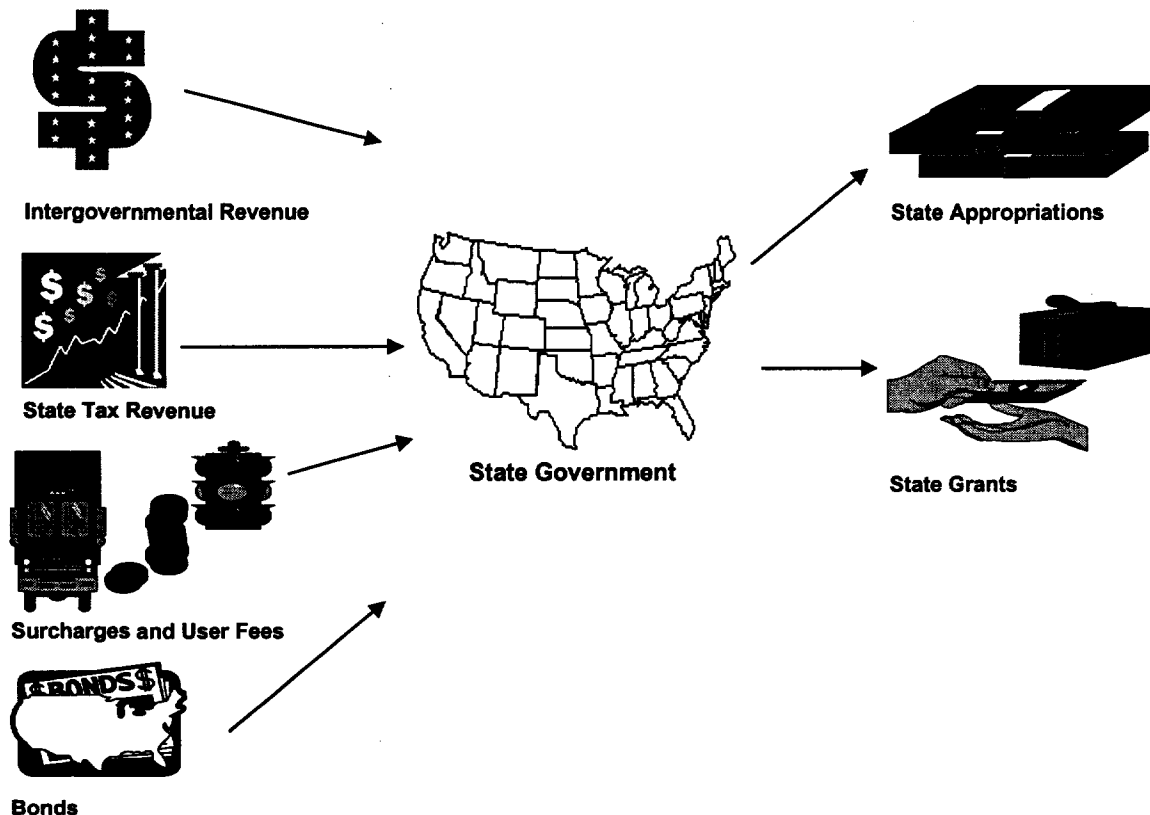
Figure 4-1
State Funding Sources

Revenue sources for states include many of the same types as those collected at the federal level. In addition to taxes, such as state income and or personal property taxes, states also use targeted surcharges and user fees. State user fees can be collected from traffic infraction revenues, use of state services, and lease fees for state–shared resources. Other sources include state bonds and state lotteries. Tax revenues, user fees, bonds, and lottery revenues are often

directed for specific purposes through appropriations or grants. They also are often targeted to finance specific agencies, projects, and initiatives.

State funding mechanisms include direct appropriations, or allocations, from the state budget, state trust funds, and grants awarded as a result of an application or other qualifying process. Often, the grant money is a federal funding mechanism which, when funneled to the state level, becomes a targeted revenue source for states along with state budget allocations. In other cases, the grant money is originated from a state–run program and is therefore used as the funding mechanism to funnel the money to public safety needs.

Although states do not share all of the same revenue sources and funding mechanisms, the following information provides descriptions of revenue sources and funding mechanisms that are generally used in many of the states.

4.1   State Government Revenue Sources

In general, state governments receive nearly a quarter of their revenue from the Federal Government and their local governments; often the majority is from the Federal Government. In addition to federal and local government money, state governments may obtain revenue from sales and gross receipts taxes, income taxes, personal property taxes, corporate income taxes, user fees, surcharges, bonds, municipal notes, and lotteries. However, revenue derived from surcharges, fees, and from miscellaneous sources, such as state lotteries and interest on invested funds, often plays a smaller role in state government financing.

4.1.1   State Tax Revenues

Most funds at the state level come from general tax revenues collected by the state. Collectively, these revenues constitute the state's general fund. A general fund is used to support budget plans, appropriations, and grants. Among the common forms of taxes contributing to the general fund are personal income taxes, sales taxes, user taxes, property taxes, cigarette and alcohol taxes, business tax receipts, hotel taxes, inheritance taxes, property transfer taxes, and excise taxes.

State public safety agencies draw operating revenues from general funds. California, for instance, finances its 911 operations using revenue from the California general fund. As the statewide 911 coordinator and the primary handler of 911 calls statewide, the California Highway Patrol (CHP) receives the majority of this funding.[27] The California Department of Forestry and Fire Protection receives the majority of its funding from the general fund. For fiscal years 1997–1998, the department received $300 million from the general fund. This amount corresponds to approximately 0.006 percent of the total available in the general fund, which is about $53 billion.[28]

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[27] Greg Brown, California Highway Patrol Program Management, telephone interview with Lisa Sabol, August 25, 1997.

[28] Fabian Favila, California Department of Finance, telephone interview with Lisa Sabol, August 27, 1997.

4.1.2 Surcharges

State funds are also drawn from surcharges that states impose on certain services, items, or penalties. Surcharges typically generate revenue needed to recover the cost associated with regulating or finding an activity or service. For example, Nevada's State Emergency Response Commission charges a hazardous material's facilities fee based on the amount of material at the facility. States levy surcharges as part of monthly phone bills to pay for 911 and Enhanced 911 (E911) services.

4.1.2.1 911 and E911 Surcharges. In 1967, the President's Commission on Law Enforcement and Administration of Justice recommended that a single number be established as a nationwide emergency reporting device. The President's Commission turned to the Federal Communications Commission (FCC) who in turn met with American Telephone and Telegraph (AT&T) to create an emergency number. In 1968, AT&T announced that 911 would be the nation's emergency code number. The Bell System established a policy to provide for the costs of necessary modifications to accommodate 911 at the Bell System's central offices. The Bell System policy made the 911 subscriber responsible for paying network trunking costs. Today, the local exchange carrier (LEC) issues monthly bills to its customers that itemize charges for local lines, directory assistance, listings, and a dedicated fee to recover the costs of providing and maintaining 911 services.[29,30]

Many states have passed laws that allow state and local governments to impose their own 911 surcharges to generate additional revenue for public safety agencies. For example, Virginia allows any county, city, or town that has established or that will establish an E911 emergency telephone system to impose a special tax on telephone service subscribers. Limitations often apply to how such 911–related surcharges can be used. For instance, Virginia's E911 surcharge can only be used for the initial capital, installation, and maintenance costs of E911 emergency telephone systems.

In the 1997 legislative cycle, 10 states passed laws to fund wireless 911 service by charging monthly user fees. See Table 4–1 for a listing of these states and surcharges.[31]

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[29] National Emergency Number Association, *The Development of 9-1-1*, National Emergency Number Homepage, #http://www.nena9-1-1.org/history3.htm.

[30] XYPOINT, *State Solutions for Implementing the Federal Communications Commission Mandate to Provide Enhanced 911 Service to Customers of Wireless Telecommunications Service Providers*, Everything Wireless Homepage, #http://www.wow-com/professional/reference/xypoint/recovery.cfm.

[31] Ibid.

Table 4-1
Surcharges on Wireless 911 Service

State	Surcharge ($)
Arkansas	.50/month
Arizona	.10/month
Colorado	.70/month
Maine	.10/month
Montana	.15/month
Minnesota	.15/month
New Hampshire	undecided
Texas	.50/month
Rhode Island	.47/month
West Virginia	.75/month

Fourteen other states have introduced legislation for a wireless 911 surcharge, but these bills have not yet been enacted.[32]

4.1.2.2 Other Examples of Surcharges. Florida, Maryland, California, and Utah have other examples of user fees and surcharges that relate to funding public safety radio communications systems:

- Florida's state statute 617.7331(6) allows $11.50 from each moving traffic violation to be used by each county to fund that county's participation in an intergovernmental radio communications program. The Division of Communications of the Department of Management Services approves this program. If a county does not participate in such a program, funds collected from moving traffic violations must be used to fund local law enforcement automation. The funds must also be distributed to the municipality or special improvement district in which the violation occurred or to the county, if the violation occurred within the un-incorporated area of the county.[33]

- Maryland's Circuit Court clerks collect similar fees from perpetrators of crimes to accumulate money for the Criminal Injury Compensation fund. This fund accumulated $131,000 in FY96 and $133,000 in FY95, and this money was remitted to the Department of Public Safety for various public safety uses.[34]

- In Wisconsin, a surcharge exists on traffic violations and a fee is imposed for most court filings, which are used to pay for state initiatives, including the Circuit

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[32] Ibid.

[33] Florida Legislature, *Florida's Statutes (Supplement 1996) Chapter 318: Disposition of Traffic Infractions*, Florida: 1996.

[34] Jeff Vogel, Maryland Administrative Office of Courts, telephone interview with Haynee Kang, August 7, 1997.

Court Automation Project (CCAP) and the Bureau of Justice Information System (BJIS).[35] Also in Wisconsin, the Department of Justice has implemented a three-tier user fees system to fund the Wisconsin Law Enforcement Network (called TIME). TIME is a statewide network used primarily to provide background check and warrant information. The various state agencies that use the system (including local law enforcement agencies) pay the lowest rate, nonprofit agencies pay a slightly higher rate, and the private sector pays the highest rate. The user fees acquired completely fund programming, operation, and maintenance of the system at the state level.[36]

4.1.3　State User Fees

User fees are levied as a means of establishing a fee-for-service construct for government services that are not used equally by all citizens. User fees are often applied to the operation of motor vehicles.

4.1.3.1 Motor-Vehicle-Related User Fees. States often fund their public safety needs by imposing user fees on motor-vehicle-related activities. Two such user fees are license plate registration fees and fees charged when issuing drivers' licenses. Colorado instituted a $1 surcharge on motor vehicle registrations and drivers' licenses to fund user and backbone equipment for radio communications. California partially funds the operations of the California Highway Patrol (CHP), including its communications needs, through a $15 surcharge on drivers' licenses and a $19 surcharge on motor vehicle registration.[37]

4.1.3.2 Other Examples of User Fees. States fund new initiatives and programs by forming consortiums or partnerships among the departments using the initiative or program. In these situations, the cost of the initiative or program is calculated yearly and a fee for each user in the consortium or partnership is calculated and assessed. This scenario can provide greater efficiencies and cost savings for all participants. Other versions of this type of funding mechanism are described as follows:

- The Telecommunications Division of the Department of General Services in California is responsible for repairs and maintenance for the majority of the state's public safety agency radio systems. This Division contracts with public safety agencies that specify an hourly rate for services related to repairs and maintenance for the contract term. When service is rendered, the Telecommunications Division bills the individual agency for which the work was performed. The Telecommunications Division also operates the state's microwave communications system and charges public safety agencies a user fee based on mileage. The Telecommunications

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[35] Scott Aker, Budget Analyst, Wisconsin State Budget Office, telephone interview with Wendy Sefert, September 5, 1997.

[36] Tony Fiore, Executive Policy & Budget Analyst, Wisconsin State Budget Office, interview with Wendy Sefert, September 12, 1997

[37] Dana Curry, California Legislative Analyst's Office, telephone interview with Lisa Sabol, August 29, 1997.

Division can offer its services to local governments to raise additional revenue and to promote system interoperability.[38]

- Utah is attempting to implement the Utah Communications Agency Network (UCAN), an 800 Megahertz (MHz) public safety interagency and interoperable radio communications system. UCAN will be financed directly through user fees. Participants of UCAN can use one of three options to pay for user fees: up-front payment for service, which is estimated to be $30–50 a month; trading other services for UCAN service, for example, sharing or trading trunked networks; or giving equipment in-kind, e.g., providing radios in exchange for service.[39]

4.1.4 Bonds

Bonds are issued as debt instruments by states, territories, and possessions of the United States as well as by other political subdivisions, e.g., cities, counties, and school districts. For example, public agencies, such as authorities and commissions, may also issue municipal bonds. All municipal bonds with maturities of more than 1 year are typically issued in denominations of $1,000 and greater and in increments of $1,000. These funding mechanisms either support a government's general financing needs or provide capital for specific projects.

Several bond mechanisms are appropriate for infrastructure capital investment, including capital expenses required for radio communications systems.

- **General Obligation (GO) bonds** are secured by the full faith, credit, and taxing power of the issuer. Only issuers possessing the power to levy and collect taxes may issue GO bonds. State GO bonds are usually secured by income, sales, and other state taxes. At the local level, the security device is often the local jurisdiction's taxing power on property. GO bonds are repaid using general revenue funds.

- **Revenue bonds** are secured based on the revenue potential of the projects to be financed. The bond issuers pledge to the bond holders the revenues generated by the financed projects. Revenues can be from user fees and tolls and are used to repay the bonds.

- **Notes** are short-term issues that assist in financing a project or help manage cash flow. Notes are interest-bearing securities that pay the interest at maturity. Types of notes include: tax anticipation notes (TAN), which are used to finance operations in anticipation of future tax receipts; revenue anticipation notes (RAN), which are issued for the same reasons as TANs but are in anticipation of revenues

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[38] Dennis Ellwell, Department of General Services Telecommunications Division, telephone interview with Lisa Sabol, August 25, 1997.

[39] Steven Procter, State of Utah, Utah Telecommunications Division Manager of Technical Services, telephone interview with Tim McEnery, August 29, 1997.

rather than tax receipts; bond anticipation notes (BAN), which are issued for immediate financing of projects that will eventually be financed through long-term bonds; and grant anticipation notes (GAN), which are issued with the expectation of receiving grants from the Federal Government.

Three states using bond initiatives to support public safety–related initiatives are Pennsylvania, Michigan, and Massachusetts. Pennsylvania has a bond offer of $50 million that provides money for a revolving loan fund with 1–3 percent interest rates for county and local governments. These funds are specifically targeted toward volunteer fire companies. Pennsylvania also plans to issue bonds to pay for its new statewide radio communications initiative, which has an estimated cost of $179 million. In a similar manner, Michigan funded the purchase of user and infrastructure equipment for its radio communications system using a $187 million state bond.

Massachusetts is constructing a statewide 800 MHz project with voice and data components. This wireless network, using trunking technology, began in 1994 and is already completed in eastern Massachusetts and in the Cape Cod area. Completion for central and western Massachusetts is projected for fall 1998. It is planned that the network, when completed will be open to all public safety agencies. More than 5,000 users are now in the Boston metropolitan area. The funding mechanism used to finance the project is two-fold: the State Police General Fund and the Capital Fund, which is allocated from the Secretary of Public Safety who is the primary source for this effort. The Capital Fund used the 1994 Transportation Bill as a vehicle for funding, and the fund is tied to a general obligation bond from the Transportation Bill.[40,41,42] From this $3 billion spending bill, the bond allocates a maximum of $48 million for this project. Two separate state bonds exist, one for $36 million, (see, chapter 173 [Sec 1J] of the Public Safety Program Loan Act of 1994) and one for $11 million (see, chapter 105 [Sec 1B] of the Public Safety Improvement Funding Act of 1996).[43]

Florida's bond system illustrates several other pertinent considerations, particularly regarding the bond process. Under the provisions of the State Bond Act (Chapter 115, Florida State Code), the Division of Bond Finance is authorized to issue all state bonds pledging the full faith and credit of the state, and to issue all revenue bonds on behalf of all other state agencies, except as otherwise provided by the Florida Constitution. The Constitution provides "that revenue bonds may be issued by the State or its agencies without a vote of the electors to finance or refinance the cost of State fixed capital outlay projects authorized by law, and for purposes incidental thereto, and shall be payable solely from funds derived directly from sources other than State tax revenues."

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[40] Craig Burlingame, Commonwealth of Massachusetts, Department of Public Safety, Criminal History Systems Board Executive Director, telephone interview with Tim McEnery, September 4, 1997.

[41] Marty Corry, Corry Associates, telephone interview with Tim McEnery, September 8, 1997.

[42] David Kennedy, Commonwealth of Massachusetts, Executive Office of Public Safety, telephone interview with Tim McEnery, September 1, 1997.

[43] Hannon Reilly, Commonwealth of Massachusetts, State House, Transportation Committee Legislative Analyst, telephone interview with Tim McEnery, September 4, 1997.

The Division of Bond Finance became the State Board of Administration on July 1, 1991. The benefits of a single entity issuing bonds include immediate market recognition, continuity, centralized expertise and resource availability, credit ratings and enhancement, and issuance time and cost efficiencies. Under Florida's bond system, it takes a minimum of 6 to 8 months to receive the actual proceeds of the sale of the bonds for a new program. Key steps in the process to obtain bond funds include: the acquisition of a bond counsel, which requires a bidding process and approval by the Governor and Cabinet; the draft, review, comment, and finalization of the bond resolution; the validation of bond proceedings; the draft and completion of official statements announcing the bond sale; and the sale and delivery of bonds.

4.1.5 State Lotteries

State lotteries also generate revenue for the state general fund and may be available for use by public safety agencies. For example, state lottery dollars in Texas are combined with tax and fee money in the general revenue fund. Lottery monies may also be earmarked for specific programs.

4.2 State Funding Mechanisms

State governments use their revenues and allocate money to public safety agencies in the form of direct state budget appropriations, trust funds, and state technology infrastructure and capital funds.

4.2.1 State Budget Appropriations

The primary funding mechanism available at the state level is a direct appropriation from the state budget. State appropriations are drawn from numerous sources, including general state tax revenues, state user fees, state bonds, state trust funds, and state lotteries. State budget appropriations are used to support the implementation of state-sanctioned programs, directives, and objectives, including the operations and initiatives of many state and local public safety agencies. Although the details vary by state, the process for obtaining state appropriations is similar to the federal process described previously. Through direct appropriations, many states finance public safety agencies and projects by allocating part of the tax, bond, and surcharge revenues that compose the state operating budget.

The Illinois State Police, for example, receives funding through state appropriations that draw from income and sales taxes and from revenues contained in a state road fund. The road fund contains motor vehicle license fees, inspection fees, overweight fines for trucks, Federal Government money, local government money, and investment income. State appropriations provided to the Illinois State Police and other public safety agencies are often used to pay for the general operation, upgrade, and maintenance of technical systems, such as radio communications networks.

In Wisconsin, biennium state budget appropriations from the General Purpose Revenue (GPR) fund, (analogous to the federal general revenue fund) are generally used to fund the needs of the various public safety agencies. Public safety is addressed at the local government level (with the exception of the state police), and each agency uses a separate radio communication system that it pays for with the money received through the budget process. The Wisconsin state agencies, which include law enforcement, fire/EMS, emergency government, hazardous material, corrections/mental health, forestry/conservation, military affairs, and highways/public works, reportedly spent $17.4 million on separate public radio systems in 1997.[44]

4.2.2 State Grants

In addition to receiving direct state appropriations, local municipalities can apply for state grants that are funded through general tax revenues, user fees, trust funds, and other sources, such as federal funds. Grant programs can be used to pay for elements of public safety radio communications systems. For instance, in the State of Colorado, grants are available through the State Department of Health, and the Division of Emergency Medical Services. The Sheriff's Office in Douglas County, Colorado, was awarded a $100,000 grant from the State Department of Health. The funds were used to purchase radios for fire service personnel using an 800 MHz digital system.[45]

State grants generally require the completion of an application or equivalent qualifying device. The process of obtaining a state grant usually takes several months from the time that a grant application is made. Applications are made typically to a state agency responsible for administering grant programs. Such agencies often handle state-specific initiatives and federal grant programs that are run at the state level. Maryland is a case in point. In 1995, the Governor's Office of Crime Control & Prevention (OCCP) was created to administer 11 federal and state criminal justice and law enforcement grants programs.

The Maryland OCCP distributes more than $13 million annually to state and local government agencies. The OCCP also assists in developing legislation, policies, programs, and budgets aimed at reducing and preventing crime, violence, delinquency, and substance abuse, including improving the administration of justice and other public safety issues. Participating OCCP agencies include: the Maryland State Police, Attorney General's Office, Department of Business and Economic Development, Department of Health and Mental Hygiene, Department of Housing and Community Development, Department of Human Resources, Department of Juvenile Justice, Department of Public Safety, and Correctional Services, and the Office of Children, Youth and Families.[46]

The State of Maryland is the recipient of funds from the following federal grant programs: Edward Byrne Memorial State and Local Law Enforcement Assistance Grants

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[44] Dave Hewitt, Director, Bureau of Communications, Division of State Patrol, telephone interview with Wendy Sefert, August 29, 1997,

[45] Mike Coleman, Douglas County Lieutenant Sheriff, telephone interview with Tim McEnery, September 2, 1997.

[46] Governor's Office of Crime Control & Prevention, *Making Maryland's Communities Safe*, Maryland, Summer 1997.

($49,340,000 in 1997); Juvenile Justice and Delinquency grants ($1,134,000 in 1996); STOP Violence Against Women Act (VAWA) grants ($1 million in 1997); Local Law Enforcement Block grants; Violent Offender Incarceration/Truth-in-Sentencing Program; and Residential Substance Abuse Treatment for State Prisoners grants. State programs include the Governor's Neighborhood Crime and Substance Abuse Prevention Grants, the HotSpot Communities Initiative ($10.5 million during the next 5 years), and the Maryland After–School Grant Program Initiative.[47]

4.2.3 State Trust Funds and Targeted Taxes

States establish trust funds to target money for specific projects and requirements. For example, Colorado has embarked on a program to implement a state network that carries public safety two-way voice traffic for the Colorado State Patrol; Departments of Corrections, Transportation, and Natural Resources; and local public safety agencies. The State Division of Telecommunications submitted a budget request for FY 1997–1998 to the Office of State Planning and Budget for $3.3 million for a pilot project in the Denver metropolitan area. A State Representative has sponsored a House bill (HB1071) to establish the Radio Communication Trust Fund of $75 million for the development and implementation of this initiative.[48]

Many states collect additional revenue from motor-vehicle-related fees and taxes and from targeted sales taxes to establish special revenue funds. For example, a state may impose a dedicated tax for highway transportation funding. In 1993, California approved a measure known as Proposition 171 that created a permanent, $0.5 cent sales tax for public safety purposes, namely, for the sheriff, the district attorney, and the probation departments. The Public Safety Sales Tax has generated more than $1.5 billion for local public safety agencies annually, with 95 percent of this revenue awarded to counties. California's Legislative Analysis Office surveyed seven counties to see how public safety has fared since the inception of Proposition 171. The office discovered that between 1991–1993 and 1995–1996 spending by public safety departments receiving Proposition 171 funds increased by 7.9 percent. However, the recent enactment of Proposition 118 has invalidated Proposition 171. Ballot approvals on a county-by-county basis are now required to reestablish this source of funding for public safety.

As another example, funding for Utah's Fire and Rescue Community Training Center is generated by a state statute, Utah State Code 53–7–104.5, which requires that 5 percent of all state resident life insurance revenue and 15 percent of all fire insurance policy revenue be placed into a separate fund. This fund finances the Utah Fire and Rescue Community Training Center.

Many states that assist the government in law enforcement have seized assets and forfeiture funds. For example, in Colorado, state asset forfeiture funds match nearly 10 percent

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[47] Ibid.

[48] California Legislative Analyst's Office, *LAO Analysis of the 1995-96 Budget Bill Part IV: An Overview of State Expenditures*, California Legislative Analyst's Office Homepage, #http://www.lao.ca.gov/p964-1.html.

of local law enforcement assistance,[49] while in Wisconsin, the state Attorney General has approved expenditures in public safety from monies acquired through seized assets.[50]

4.2.4 State Technology, Infrastructure, and Capital Funds

Many states have technology improvement funds or infrastructure funds that provide funding for information technology–related projects. For example, Maryland's Office of Information Technology (IT) was established to administer such funds in conjunction with the Department of Budget and Management. The Office of Information Technology and the Technology Investment Fund provide sources of funding for IT projects that must meet the following criteria:

- Projects must, through quantifiable benchmarks, either realize the state's shared vision, achieve universal citizen access, maximize customer satisfaction, or promote the efficient and effective operation of government.

- Projects must facilitate breakthrough improvements in business efficiency.

- Projects must drive toward a statewide or interagency implementation.

The Technology Investment Fund receives its capital from appropriations, contributions, sale of IT resources, disposition or depreciation of information processing equipment, proceeds from the sale of bonds, and as otherwise prescribed by law.[51]

To help fund communications and technology upgrades, the State of Nevada has moved a portion of the capital improvement fund to a technology improvement fund. This fund, which would operate through a grant program, would allow departments, agencies, cities, and counties to fund new technology initiatives. Nevada State Bill 101 transfers $19 million from the state general fund and the state highway fund to implement technology improvement.[52,53]

Colorado has a capital construction fund that receives its funding from the state's general fund. A board determines the distribution of these funds based on state priorities. Previously, the capital construction fund has held more than $100 million. Portions of this money were used by the Colorado Division of Criminal Justice.[54]

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[49] John Enman, State of Colorado Department of Criminal Justice, telephone interview with Tim McEnery, August 25, 1997.

[50] Bradley DeBraska, President, Milwaukee Police Association, telephone interviews with Wendy Sefert, August 27, 1997.

[51] Maryland Department of Budget and Management, *Office of Information Technology*, Maryland Homepage, #http://www.inform.umd.edu/umstate/md_resources/DBFP/oit.htm.

[52] Nevada State Legislature, *Senate Bill No. 21-Committee on Finance*, Nevada State Homepage, #http://www.leg.state.nv.us/97bills/sb/sb201_en.html.25.

[53] Public Safety Division, Department of Motor Vehicles and Public Safety, interview with Andy Staton, August 12, 1997.

[54] John Enman, State of Colorado Department of Criminal Justice, telephone interview with Tim McEnery, August 27, 1997.

In Wisconsin, the 1995-97 budget included an important innovation in the funding for technology with the creation of the Information Technology Investment Fund (ITIF). The ITIF was created to augment funding for state agencies (primarily GPR-funded agencies) that lack sufficient base funding to invest in technology. The long-term goal of the fund is to provide seed capital for development and implementation of innovative projects to redesign and reengineer the operation of state agencies. Funding for the ITIF comes from an annual user fee paid for by vendors seeking to do business with the state. This fee serves as a subscription to the state's new VendorNet service. Purchasing the service allows vendors to gain access to information about procurement by state agencies electronically through the Internet.[55]

The revenue source for the ITIF is voluntary and is paid only by those vendors who utilize the service. The Department of Administration is marketing VendorNet, but until the service gains a greater posture, alternative funding mechanisms are necessary. For example, the Governor of Wisconsin has recommended a one-time reallocation of $2 million GPR annually from state operations to the ITIF for the 1997-99 biennium. The additional funds would be directed at encouraging innovative projects using the information technology (IT) infrastructure and will provide resources for state agency IT infrastructure development and other technology projects. Further, the Governor's proposed supplemental funding would allow the state to build on the $3.8 million invested through the fund in the 1995-97 biennium.[56]

4.2.4.1 Fire Programs Fund. Another example of a targeted fund is the State of Virginia's Fire Program Fund.[57] Virginia's legislature established this fund, which is administered by the Department of Fire Programs. The fund is a special, non-reverting fund, which means all money deposited into or remaining in the fund will not revert to the State general fund but will remain in the Fire Programs Fund until expended. This fund is to be used to support volunteer and career fire-fighting personnel in each of the receiving localities. It is also intended to fund fire prevention and public safety education programs; the construction, improvement, and expansion of regional or local fire service training facilities; and the purchase of personal protective equipment, vehicles, and other equipment and supplies used in the receiving locality specifically for fire service purposes. Distribution of 75 percent of the fund is made on the basis of population. No county or city eligible for funds will receive less than $10,000 and no eligible town will obtain less than $4,000. Each locality receiving money from the Fire Programs Fund must report annually to the Department of Fire Programs on the use of funds, and it must provide a completed fire programs fund disbursement agreement form. If, at the end of the annual reporting period a recipient does not provide a satisfactory report, that recipient will not receive funds for the following year.

4.2.4.2 Victim of Crime Fund and Criminal Injury Compensation Fund. Other targeted funds pertain to penalties imposed on criminals or as a result of criminal behavior. For example, Chapter 313 of Maryland's Acts of the General Assembly of 1997 allows Maryland Circuit Court

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[55] State of Wisconsin, *Budget in Brief, February 1997*. Uniform Resource Locator http://www.doa.sate.wi.us/debf/9799bib.htm.

[56] Ibid.

[57] Virginia General Assembly, "An Act to Amend and Reenact §§9-155 and 38.2-401 of the Code of Virginia, Relating to Virginia Fire Services Board; Fire Programs Fund," Virginia, 1997.

clerks to levy a fee on individuals who are convicted of committing crimes. The fees are contingent on the severity of the crime but average around $80. One such fund, the victims of crime fund, which collected $116,000 in FY96 and $115,000 in FY95, channels the fees into the Governor's Office, for deposit in the state general fund.[58]

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[58] Texas Comptroller's Office, "Texas Lottery Information," Texas Comptroller's Office Homepage, #http://www.window.state.tx.us:80/txgovinf/txlottery.html.

5. LOCAL FUNDING SOURCES

Local governments provide their public safety agencies with funding via revenue sources generated from federal, state, and local governments. This section focuses on the revenue sources needed to create funding mechanisms on the local level. It also addresses how these funding mechanisms are used by local governments for local agencies' missions. Among the revenue sources considered at the local level are taxes, surcharges, and fees for services. These revenue sources enable local governments to provide public safety agencies with funding mechanisms such as direct appropriations, county capital improvement plans, county investment funds, lease revenue bonds, and certificates of participation.
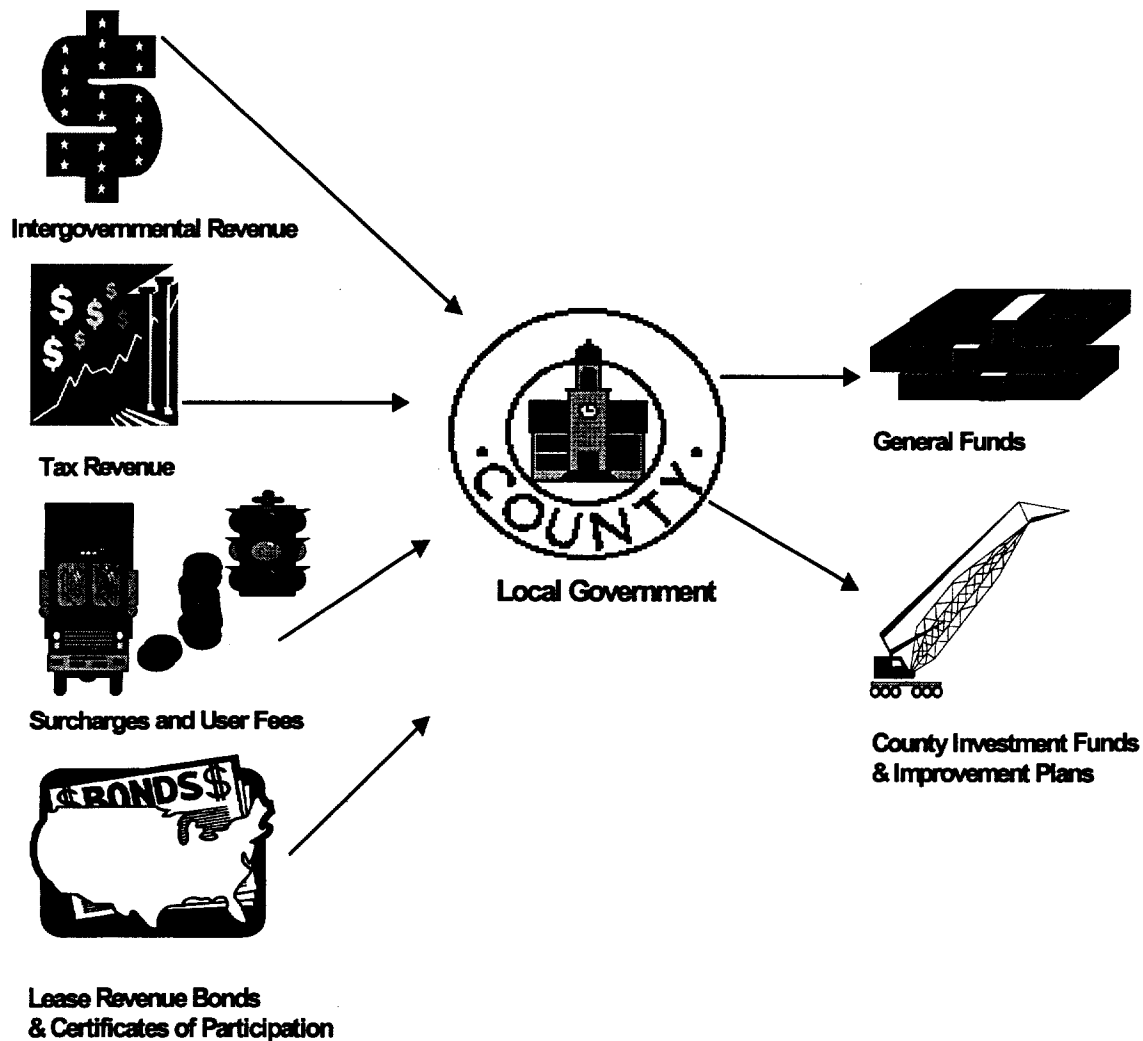

Figure 5-1
Local Funding Sources

5.1   Local Government Revenue Sources

Local governments may receive nearly 40 percent of their revenue from the Federal Government and state governments, and the rest primarily through property taxes and surcharges. These revenue sources are funneled into a local government's general fund. Local governments obtain the majority of the rest of their revenue from taxes. For example, in Arlington County, Virginia, the county general fund is composed of revenue generated from local taxes (40 percent from real estate taxes), fees (such as library fines, refuge and recycling fees, charges for clinics, and hook–up fees for the water and sewer systems), and state and federal reimbursements (10 percent is from the state and federal levels for state and federal directives).[59] Although local governments vary in the types of taxes used (for example, not all governments collect an income tax), many local governments impose taxes on general property, general sales, individual income, corporate and business income, motor fuel, cigarettes, and alcoholic beverages. Unlike the Federal Government, local governments do not rely heavily on individual income taxes, and unlike state governments, they rely much less on sales taxes.[60]

Local governments are also able to raise specific taxes or apportion percentages of taxes specifically to fund public safety initiatives. For example, several years ago Las Vegas, Nevada, raised the personal property tax $0.05 for every $100 of assessed value. This measure has allowed them to raise almost $1 million a year for the city, enabling the city to establish its 911 system. Today, in a joint program with Clarke County (the county adjacent to Las Vegas, Nevada), Las Vegas has implemented an 800 MHz communications system using this method of funding.[61]

5.1.1   Surcharges

Although states generally set limits on surcharges, local governments are usually able to determine adequate surcharge compensation levels within state-defined boundaries. Two prominent surcharges for local public safety agencies have been the 911 and E911 surcharges. For example, in Wake County, North Carolina, commissioners are trying to encourage local leaders to join them in asking the legislature to impose the 911 surcharge currently included in traditional telephone bills onto cellular phone service bills as well. This action would create revenue to purchase a new 800 MHz emergency communications system and center. Traditional telephone customers currently pay $0.11 cents a month to finance 911 dispatch; the county has the authority to increase this surcharge. A proposed plan would also increase the surcharge on traditional telephone customers from 11 cents to $1. Such 911 surcharges can generate a significant amount of money for local governments and public safety agencies. For example, Dubuque County, Iowa generates approximately $500,000 annually from a $1 monthly surcharge on E911 services.[62]

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[59] Barbara Edwards, Arlington County Management and Finance, telephone interview with Haynee Kang, August 19, 1997.

[60] Robert D. Lee, Jr. and Ronald W. Johnson, *Public Budgeting Systems*. Baltimore: University Park Press, 1983.

[61] Leslie Doak, Budget Director for the Nevada Office of Budget and Management, telephone interview with Andy Staton, August 14, 1997.

[62] Craig Reber, "Emergency Radio System Nears Approval," Telegraph Herald, A3: February 29, 1997.

5.1.2 Fee for Service

Many local governments impose charges for current services, such as library, swimming pool, and cemetery fees; repair and damage recoveries; election fees; planning and miscellaneous filing fees; police, fire, engineering, redevelopment, and parking citation services; communications services charges; and automobile abandonment retrieval fees. For example, in San Diego, California, the fire department charges for its services and expects to collect $1.9 million in FY98, while collections generated by the police are expected to total $1.8 million in FY98.[63]

Local governments can levy user fees for specific public safety needs to generate revenue. For example, Orange County, North Carolina EMS charges residents a fee for emergency medical care to offset the associated costs. As of October 1, 1996, residents are charged $100 for assessment, treatment, and referral (without transport), $250 for Basic Life Support (BLS) treatment and transport, and $350 for Advanced Life Support (ALS) treatment and transport.[64]

Localities sometimes charge fees on permits granted for new construction in the city. These fees can pay for capital purchases, such as communications equipment. The City of Folsom California Fire Department is funded by this type of fee, which in Folsom is called a Fire Impact Fee.[65]

Some fee-for-service arrangements involve local governments from one jurisdiction providing services to governments from another jurisdiction. For example, the City of San Jose, California, sells its public works laboratory services to other jurisdictions or contracts services to other public agencies. It has transformed a vacant building, purchased by the city in 1983, into a public-private partnership conference center. San Jose has generated between $4 to $10 million annually through such entrepreneurial projects. Similar efforts have been undertaken by the City of Palo Alto, California, which sends animal control officers to the cities of Los Altos, Mountain View, and Redwood City. Palo Alto sells fleet maintenance to other government agencies and has leased time for use of the police firing range and for a criminal evidence room. These efforts offset the cost of a new police station.[66]

5.1.3 Lease-Purchase Financing Bonds and Certificates of Participation

Lease Revenue Bonds (LRB) and Certificates of Participation (COP) are financing tools that provide public agencies with long-term financing to acquire or construct specific equipment, land, or facilities. LRBs and COPs are used by public agencies (e.g., counties, cities, redevelopment agencies, school districts, special districts, transportation authorities, hospitals, and higher education institutions) for financing public-use infrastructure. Since 1981, COPs and LRBs have been the single largest source of funding for local public infrastructure.

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[63] City of San Diego, *Proposed Annual Budget Fiscal Year 1998*, Vol. 1.

[64] Orange County, NC, "Orange County EMS Fee Schedule," http #: http://www,ned,ybc,edy/~jeg/fees.htm.

[65] Eric Dutton, City of Folsom, CA Fire Department, telephone interview with Lisa Sabol, September 8, 1997.

[66] Janet Rae-Dupree, "California Cities Cut Deficits By Selling Services," *Knight-Ridder Newspapers*, July 20, 1994.

In a lease-purchase financing arrangement, the government, as the lessee, buys a property from the lessor through installment payments made during a given period of time. The leasing fees are legal operating expenses subject to appropriation each year. When all payments have been made, the government receives full ownership of the property. On larger transactions, investors buy COPs that give them a share of lease payments made on that property. Certificates are generally issued in $5,000 denominations, and each certificate signifies that the investor owns a proportional interest in the lease payments made by the governmental entity. Often a trustee, usually a bank, handles the distribution of lease payments from the government to COP holders and manages any legal proceedings if payments do not arrive. Some cities pool their resources to create one program, thus giving the participants the advantages of economies of scale, tax exemption, and an established credit rating. Features of COPs programs include the following:

- COPs do not require voter approval. A city can enter into a lease and purchase with no bond election requirement.

- 100 percent financing. The lease and purchase agreement may be structured to allow installation, handling, insurance, and other initial costs incurred with the project to be included in the payments.

- Competitive interest rates. The COP has a higher yielding interest rate because it is less secure than debt and generally funds must be appropriated yearly and the appropriation process may be subject to politics. The interest portion of the lease payment is exempt from federal income taxation for the investor, resulting in lower interest rates for each participant.

- Tax-exempt payments for municipalities. A tax-exempt lease and purchase agreement generally offers an even repayment schedule, no lump sum, and usually no down payment. This structure conserves capital and enables the city to easily budget and disperse the cost of the asset over multiyear periods. However, payments may be structured to conform to income sources that are not received evenly.

- Ownership of the asset. Cities use the asset during the term of the obligation and ultimately own the asset after the terms of the agreement have been fulfilled.

- Flexibility in structure. Given a fixed budget, a participant may structure the agreement in a variety of ways. Lease and purchase financing is a suitable and economical method for financing capital assets that are too expensive to fund during a 1– or 2–year period.[67]

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[67] Ontario Montclair Strategic Action Plan Committee, *Certificate of Participation Programs*, City Limits Homepage, #http://www.citylimits.com/OMSD/technology/cop.html#COP."

In 1991, new COPs exceeded $8 billion. More than 60 percent were in California because of the high infrastructure demand and strict controls on traditional finance.[68] The city of Tucson, Arizona, has used the COP model to purchase public safety radio equipment and upgrades and to fund real property acquisition and capital improvements.[69,70]

5.2 Local Funding Mechanisms

Local governments use the revenue collected from taxation, bonds, surcharges, and fees to create funding mechanisms for local operations. Many public safety agencies receive annual appropriations from their local governments' general funds. They also receive money through more indirect sources such as capital improvement plans, lease-purchase financing bonds, and certificates of participation.

5.2.1 Local General Funds

Public safety agencies are supported through general funds. A general fund is an operating fund that local governments use to pay for basic local government services, such as public safety, street maintenance, refuse collection, parks and recreation, and libraries. These services are mostly paid for by tax revenue but are also supported by surcharges and fees. For example, Arlington County's Emergency Communications Center—a coordinated county police, fire, and (EMS) dispatch center—receives most of its funding from the county general fund. Arlington County's general funds helped purchase an $8 million 800 MHz communications system.[71] The county originally intended to lease the system using a planned pay-as-you-go budget scheme. After reconsidering this plan, Arlington County decided to buy the system using capital funds: $7.6 million of the total $8 million cost came from the general fund. The county is now using the money set aside for the pay-as-you-go scheme to finance the buyout of the system.

5.2.2 Local Investment Funds

Many counties, localities, and states establish investment funds similar to state trust funds. An investment fund generally refers to the use of surplus cash for investments. For example, Fairfax County, Virginia's Office of Finance Investment and Cash Management Division maintains a cash investment fund that holds cash and temporary investments for all funds in a single pooled account.[72]

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[68] John L. Mikesell, *Fiscal Administration: Analysis and Applications for the Public Sector*, 4th ed. New York: Harcourt Brace College Publishers, 1995.

[69] Ibid.

[70] Katie Burke, Communications Superintendent for the Tucson Information Services Bureau, telephone interview with Andy Staton, August 18-22, 1997.

71 Steve Souder, Arlington County Emergency Communications Center Director, telephone interview with Haynee Kang, August 19, 1997.

[72] County of Fairfax, Virginia, *Comprehensive Annual Financial Report*, Fiscal Year 1996.

5.2.3 Local Capital Improvement Plans

County capital improvement plans are similar to state capital improvement funds. Generally, county capital improvement plans are separate from the county or city budget and contain sums of money that sustain funding needs for a fixed number of years. Local–level capital improvement plans are usually managed by a city council or a county board. For example, in San Diego, California, a capital improvement is generally a large construction project, such as the development of a park, the construction of an overpass, or the installation of a traffic signal. In San Diego, California, these funds are supported by water and sewer fees, a $0.05 cent local sales tax for transportation improvements, developer impact fees, grant funds, and bonds.[73]

Arlington County, Virginia has a Capital Improvement Plan (CIP). The CIP is separate from the county's general fund budget. Arlington County's CIP runs on a 5–year cycle. Arlington County is currently within the 1998-2003 cycle and this cycle contains $449.5 million. 64 percent of the $449.5 million came from bond and lease purchases, and 36 percent came from a pay-as-you-go scheme, state highway funding, and hook-up fees. Arlington County's CIP funds can be used for storm drainage, parks government buildings, and public safety.

To obtain bond revenue, county board approval is required. After approval, the bond must be advertised and a hearing must be conducted to allow citizens to learn and ask questions about the bond. The bond is then placed on the ballot, and if approved by the voters, the county board issues the bond in the marketplace.

The pay-as-you-go funding scheme is coordinated by the county manager. The county manager is responsible for approving yearly requests for funding taken out of the CIP. If the county manager approves a request, it is submitted to the CIP's capital budget staff for further review. The capital budget staff must approve the request before it is presented to the county board. The county board reviews the request, and if the request is approved, the board appropriates a specified amount of funding.[74]

Fairfax County, Virginia, also has a CIP for fiscal years 1998–2001. The CIP provides a framework for predictable capital expenditure and timely scheduling of bond referenda. The program targets the completion of previously approved funding commitments and a few new projects. The CIP is supported by a combination of debt, pay down, and special revenue financing. The primary revenue source is general obligation bonds.

Within this CIP, general funds are targeted for facility management projects and public works improvements, while enterprise funds have been targeted for the Water Authority and the County's sewer and waste management needs. New funding of $80 million is included for a 1998 proposed Public Safety/Courthouse Facilities referendum. This project would provide

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[73] San Diego, California Budget and Management Services, Proposed Annual Budget Fiscal Year 1998 vol. 1.

[74] Barbara Edwards, Arlington County Management and Finance, telephone interview with Haynee Kang, ,August 20, 1997.

about $44 million to expand the courthouse and $36 million to expand governmental and police centers, fire stations, and fire safety improvements. Fairfax County has no legal limit on the amount of bond debt that it can incur or have outstanding, although all debt must be approved by voter referendum before borrowing is initiated.[75]

Montgomery County, Maryland, is using a CIP to fund the voice system portion of their 800 MHz radio communications system. The target cost for the voice system, if funded entirely by the CIP, is $17 million.[76]

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[75] Fairfax County, VA Office of Management and Budget, *FY 1998-FY 2002*, http#: www.co.fairfax.va.us/gov/omb/cip97.htm.
[76] Gary McKelvy, Program Manager of Telecommunications DIST, interview with Brian Love.

6. PUBLIC and PRIVATE PARTNERSHIPS

Public and private sector groups are starting to combine their resources to provide funding and operational services in the communications field. This cooperation allows these groups to combine their funding sources to pay for more efficient, modernized service, share scarce bandwidth, and combine their operational efficiency in industries that are interdependent. Figure 6-1 highlights some of the benefits of public and private partnerships.
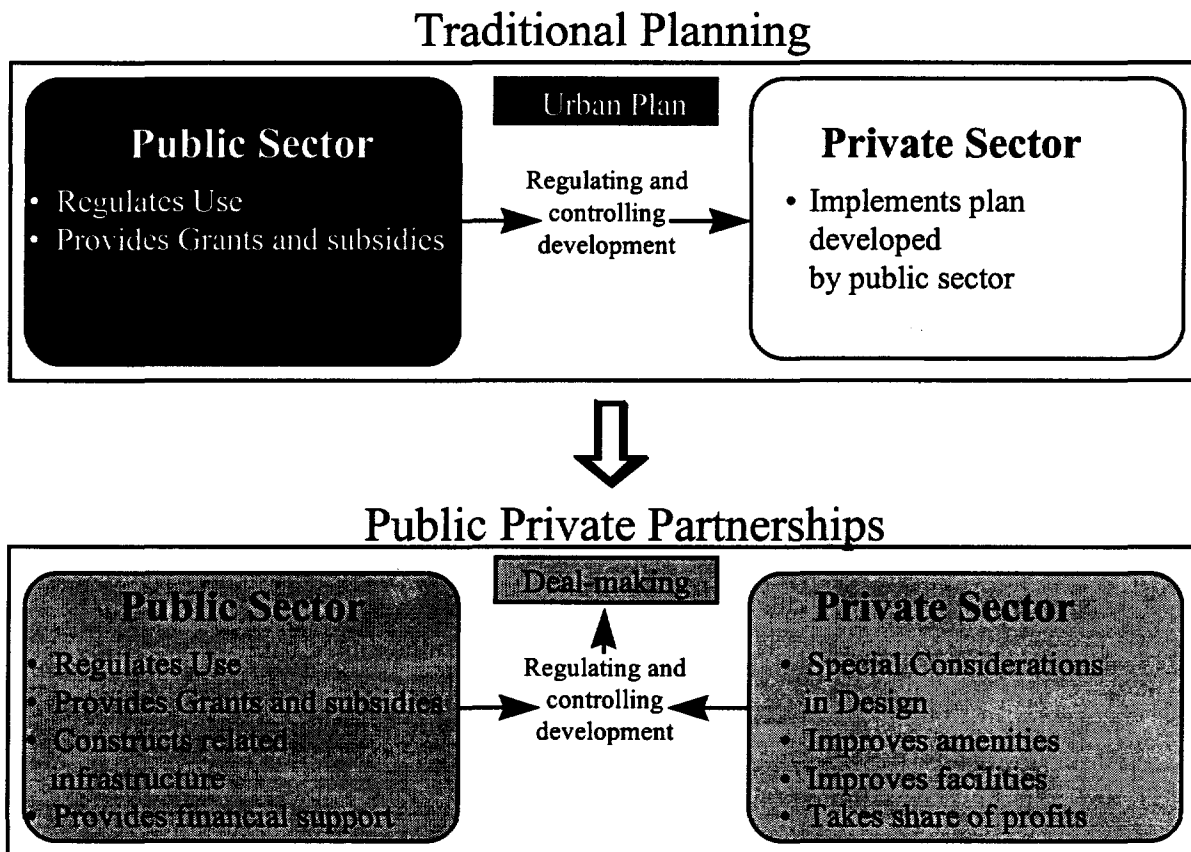
Figure 6-1
Advantages of Public/Private Partnerships

6.1 Examples of Public/Private Partnerships

The State of Nevada, through the Nevada Department of Transportation (NDoT), initiated a plan to improve and enlarge its communications systems by joining with Nevada utility companies in a public and private partnership. This partnership allows for public and private entities to consolidate their equipment and facilities to save resources.

The effort began when Nevada Power showed an interest in using some of the NDoT frequencies because its own bandwidth was approaching full capacity. The power company obtained a waiver from the FCC to use the frequencies for safety and maintenance purposes only. After agreement between the two stakeholders was reached, NDoT moved into the Nevada

Power communications facilities and, although each group owned a separate portion of the infrastructure, the system operated as a shared system.

Because of the success of this effort, NDoT received numerous inquiries from the North Las Vegas Police Department, the Sierra Power company, Nevada Gas, and the University of Nevada at Las Vegas on the possibility of forming a shared "user group" of the communications network. Participants would provide the necessary equipment (radios, transmitters, antennas, etc.) of the shared system. The result of those discussions was a restructuring of the NDoT Communications Department. NDoT's Communications Department was merged with the shared data processing unit. Additional funding from the consortium members was used to jump-start the program. Today, due to shared resources, the NDoT saves between $100,000 and $300,000 in funds.[77]

Many volunteer fire and EMS companies raise funds from the private sector. Public fire departments also are increasingly using private donations. Occasionally, revenue collection is encouraged by setting up nonprofit foundations.

Favorable consideration of these sources is influenced by the benefit private sector input can provide, such as state-of-the-art equipment, training, and market research indicating the best techniques. Other factors to consider when engaging the private sector include the potential need for expertise in preparing tailored proposals to obtain corporate donations and grants from foundations.

The City of Scottsdale, Arizona, has entered into a partnership with the Arizona Public Service Company (APS) to mutually pursue energy efficiency in the city's facilities. In the first joint project, APS advanced $153,500 to retrofit seven city facilities with energy efficient lighting. These funds will be repaid in monthly installments included on the electric utility bill for each facility. Funds for the repayment originate from the energy savings for the facility. The repayment period is 5 years with no penalty for early repayment. APS paid the lighting retrofit contractor, which did not affect the city's budget.[78]

Local governments may need additional funding beyond funds allocated from the county governments. To pay for some capital programs, public safety agencies may contract portions of the program to private entities. Private contracting may be the most cost effective way to provide service. For example, the Scottsdale Fire Department is owned by a private company called Rural Metro, which provides fire and rescue services to Scottsdale. The City of Scottsdale has a contract with Rural Metro, but residents outside of the city limits must contract with Rural Metro individually. For instance, a subscriber of Rural Metro who lives in an 1,800 square foot house pays Rural Metro $181 a year, or approximately $.10 a square foot.[79]

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[77] Roger Grable, Assistant Director of Administration for the Nevada Department of Transportation, telephone interview with Andy Staton, September 3, 1997.

[78] Resource Development Group, *Scottsdale's City Services*, City of Scottsdale Homepage, #http://www.ci.scottsdale.az.us/gprdgweb.html

[79] Ibid.

The Giuliani administration has employed the International Management Group, a marketing agency, to assist the city in obtaining corporate sponsors for items such as playgrounds, snack bars, litter baskets, and police patrol cars. Industry experts maintain that companies may be willing to pay millions to be an "official" product or service of New York City or one of its institutions. For example, under the plan, a company like Coca-Cola may pay to be the exclusive drink sold at all city-run concession stands or an automaker like Ford may pay to call its Crown Victoria model the official patrol car of the New York City Police Department. Similar commercial initiatives have occurred in other cities. Los Angeles County, California, beaches have an official suntan lotion and bottled water, while Buffalo, New York, has an official health-maintenance organization and an official paint. Lesa Ukman, editor of the IEG Sponsorship Report, noted that, if managed effectively, New York's sponsorship program could generate the fund-raising potential of the Olympic Games, which charged major corporations up to $40 million for several years for the right to use the Olympic logo.[80]

Improving South Carolina's Radio Communication Systems is a priority of South Carolina's State Plan on Technology initiative. During the past 3 years the state has developed plans, and is now implementing, a state-owned mobile data communications system (MDCS), to be used by Public Safety, Highway Patrol, State Law Enforcement, Wildlife, Transportation, Corrections, Forestry, Employment Services, Health and Environment Control agencies, among others. In addition, the state is establishing a contract for agencies requiring upgrades of existing voice radio systems to lease 800 MHz of trunked radio service. The financial mechanism behind the plan raises funds through public and private partnerships. One-third of the funding for the partnership is to be provided by local governments, one-third by the utility companies, and one-third by each state agency (specifically the Office of Public Safety).[81]

Additionally, the State of South Carolina also has the Emergency Communications Network (ECN). The ECN is an emergency facility to be used only when standard telephone service supporting a critical health or public safety function has been disrupted or has become unreliable to the point of jeopardizing that function, or when a local, regional, or statewide emergency or disaster situation has been declared. The ECN consists of about 100 telephones located statewide in county emergency operations centers, public safety agencies, hospitals, and other critical locations. The ECN also includes access circuits connecting these 100 telephones to major switching centers, and diverse systems of statewide trunks capable of routing and rerouting calls around troubled areas.

Each county in the state also has an Emergency Operations Center. The Emergency Operations Center designates the location of the emergency telephones in each county, establishes a plan for activating these telephones, and coordinates the ECN use when a disaster is

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[80] David Halbfinger, "From the Battery to the Bronx, New York Seeks Corporate Sponsors," *New York Times*, May 1, 1997, sec. B:5.

[81] Ted Lightle, Director of Office of Information Resources, Columbia, SC, interview with Andy Staton, August 18–22, 1997.

declared. These facilities are donated at no cost to the state by an impressive list of both national, regional, and state telecommunications manufacturers and service providers.[82]

6.2   Foundations[83]

Foundations provide funding for an array of programs and services. There are various national grant providers whose concerns for national, state, and local policy, public affairs, and health and human services reach all segments of society. Organized philanthropy exists in two forms: public charities and private foundations. Private foundations also incorporate independent and corporate foundations.

Examples of various public safety entities that have received funding from foundations are as follows:

- The County of Midland, located in Midland, Michigan, was a recipient of the Herbert H. and Grace A. Dow Foundation for the amount of $150,000. The funding was used to provide upgraded service for the 911 Central Dispatch Center.

- In 1995, the Dallas Police Department, Narcotics Division, located in Dallas, Texas, was a recipient of $106,500 from the Meadows Foundation Inc. The funding was used to purchase computer systems and equipment for enhancements to the computer information systems linking city and county law enforcement efforts to deter drug trafficking.

- The State of Indiana, Department of Corrections located in Indianapolis, Indiana, was the recipient of $100,000 from the Edna McConnell Clark Foundation in 1994. The funding helped to document, expand, and institutionalize community corrections programs to enable policy makers to evaluate community corrections programs, plan for integration of a criminal justice information system, and analyze training needs for probation, parole, and community corrections.

- The Vera Institute of Justice, located in New York, New York, was a recipient of $100,000 from the Edna McConnell Clark Foundation in 1994. The funding was used for computer equipment and software and to train staff in using and maintaining a criminal justice node on the Internet.

- The National Council on Crime and Delinquency (NCCD) located in San Francisco, California, was a recipient of $17,500 from the Edna McConnell Clark Foundation in 1993. The funding was used to design an information system that will be used by several government agencies, including the Department of

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[82] Office of Information Resources, *South Carolina Emergency Communication Networks*, South Carolina Homepage, #http://www.state.sc.us/sceninfo.html.

[83] The Foundation Center, *The Foundation Directory*, Washington, DC: 1997.

Corrections, Administrative Office of Courts, and Board of Pardons and Parole to collect and track criminal, work, and family histories of offenders, their arrest and conviction data, parole board actions, information about sentencing, conditions of probation or parole, and performance while under community supervision.

- The City of Glendale Police Department located in Glendale, Arizona, was the recipient of $14,850 from the H. N. & Frances C. Berger Foundation in 1993. The funding was used to purchase computer equipment.

- In 1995, the Mayors Alliance for a Safer Los Angeles, located in Los Angeles, California, was the recipient of $1 million from the Ahmanson Foundation, California. The funding was used towards a capital campaign to modernize the Los Angeles Police Department's technology and training methods.

- In 1995, the University of Southern California, located in Los Angeles, California, was the recipient of $500,000 from the Weingart Foundation, California. The funding was used to provide training for the purchase and implementation of a new Los Angeles Police Department computer network.

- In 1995, the North Dakota Council on Abused Women's Services, located in Bismarck, North Dakota, was the recipient of $30,000 from the Otto Bremer Foundation, Minnesota. This program was designed to implement a Criminal Justice System Monitoring Program, which was an effort to demonstrate the need for a statewide data collection system recording incidents of domestic violence.

- In 1995, the Bucyrus Police Auxiliary, located in Bucyrus, Ohio, was the recipient of $14,000 from the Timken Foundation of Canton, Ohio. The funding was used to purchase radios and bullet-proof vests.

- In 1995, the Weed Police Department located in Weed, California, was the recipient of $39,459 from the Ford Family Foundation. The funding was used to purchase radio equipment.

- The City of Diboll, located in Diboll, Texas, was the recipient of $18,545 from the Temple Foundation in 1994. The funding was used to purchase a computer for its Police Department.

- Telecommunications for the Deaf, located in Silver Spring, Maryland, was the recipient of $35,000 from the NEC Foundation of America in 1994. The funding was used toward a year-long examination of nationwide telephone emergency services, including 911 services, to develop consensus among deaf and hard-of-hearing consumers, emergency service providers, government entities, and the telecommunications industry.

- The Advocacy Institute, located in Washington, DC, was the recipient of $100,000 from the John D. and Catherine T. MacArthur Foundation in 1994. This was a 1-year grant to develop an interactive communications system for advocates of gun violence prevention.

Appendix B provides contact information for foundations which contribute to various public safety type projects.

6.3   Endowments

An endowment is a gift wherein the principal is held in perpetuity and where the money is used in whole or in part for designated purposes. For instance, a citizen could establish an endowment of a certain sum of money, say $10,000, where the money was expected to earn an investment return of approximately 10 percent. Then each year, $1,000 would be paid to fund a project of the donor's choice with the net income balance being reinvested for growth each year.

In Arizona, the Scottsdale Community Endowment Program was created to offer citizens an opportunity to ensure that the causes and programs they supported during their lifetime could continue far into the future. Scottsdale offers donors a great degree of flexibility in designing their charitable legacies. Endowments can direct their gifts toward the following discretionary funds: human resources, youth services, parks and recreation, public safety, libraries, culture and the arts, and the McDowell Mountain Preserve. Scottsdale has a partnership with the Arizona Community Foundation (ACF) to professionally administer its charitable funds and keep the dollars perpetually useful. Through a special program, endowment gifts can be matched by the ACF.

Scottsdale also accepts gifts ranging from furniture for the teen center to artwork for City Hall. For example, the Shipp family, long-time Scottsdale residents and business owners, chose to give a mounted patrol and bicycle unit to the Scottsdale Police Department.

6.4   Other Public and Private Arrangements

Several other public and private arrangements are potential models for cooperation and represent potential alternative funding sources for public safety communications projects.

6.4.1   Economic Development Authority

A special act of the state legislature can create an economic development authority. The economic development authority then coordinates the economic development plans of the county with public sector groups such as the Chamber of Commerce. This approach allows for a more focused effort to promote and develop an area or specific infrastructure project. The public-private partnership works by using local government funding and private sector income to maximize available resources.

6.4.2 Direct Solicitation

Public safety departments such as volunteer fire departments often use this method. They as well as others, often take the straightforward approach of door-to-door solicitation or direct mail solicitation.

6.4.3 Fund-Raising Events

Volunteer fire-fighters traditionally raise funds by bake sales, barbecues, carnivals, dinners, picnics, casino nights, sporting events, and a wide variety of other types of fund-raising activities. Citizens may balk at new fund-raising mechanisms, and therefore they need to be included in the discussion of the need for improved or new equipment and services at the outset. Many safety providers use professional fund-raisers to assist in approaching the private sector. Scottsdale, Arizona's Community Services Department and Environmental Management Division has raised more than $1 million from fund raising. For example, Arizona's Paiute Neighborhood Center has successfully found contributors to help refurbish buildings and enhance programs. Additionally, the Scottsdale Community College has agreed to provide educational services and assistance in outfitting classrooms with equipment.

6.4.4 Corporate Donations

Both volunteer and paid fire departments have been successful in soliciting grants and services from local and national corporations. These sources may be involved in safety (e.g., insurance companies, manufacturers of fire-related equipment, manufacturers of products involved in fires, manufacturers of telecommunications equipment), or may be interested in enhanced public relations and performing community services.

6.4.5 Private Foundations

Some communities are fortunate to have local foundations whose funds can be used for providing special public safety services, starting new services, helping low-income areas, or other services allowed by their charters. Some national foundations also contribute to fire, EMS, and law enforcement services.

6.4.6 Reduced and Shared Costs

Shared funding of infrastructure can reduce costs for both the government and private industry. This is achieved by sharing infrastructures such as tower sites. By leasing space on tower sites to commercial providers on a voluntary basis, local governments, including public safety agencies, may be able to realize additional revenue for maintenance or other public safety needs.

The State of Ohio's Department of Administrative Services noted, "One method of cost containment we plan on utilizing is sharing of resources with various utility providers. In return for tower space, we will permit and encourage direct communication between a utility

company's operations center and the State's Emergency Management Agency." By permitting commercial services to collocate their facilities on the towers of local governments and public safety agencies, commercial services will be able to provide more wireless services (even in sparsely populated areas) while providing additional revenue sources for local governments and public safety agencies to run these important programs.

6.4.7 Incentives for Private Investment

The government could institute policies that give firms incentives to pay for a portion or all of the capital investment in new equipment and lines, thereby encouraging the private sector to invest in infrastructure development. This can be achieved by decreasing the cost of participation in infrastructure development.

6.4.8 Accelerated Depreciation

Firms investing in capital for critical infrastructure development could be allowed to have an accelerated depreciation period to amortize their capital investments, thereby encouraging investment.

6.4.9 Business Expense Deductions

Some activities impose business expenses, but not investments, on corporations (e.g., background checks, industry government communications channels). Under the charitable deduction rule, these expenses could be a corporate income tax deduction, or these expenses could be treated as ordinary and necessary business expenses, and therefore deductible. This allows firms to recoup a portion of their expenses.

6.4.10 In-Kind Reimbursements

The government could arrange for infrastructure enhancements through in-kind reimbursements. Instead of capital being exchanged for goods and services, the government could arrange for the transfer of a variety of commodities, include equipment, technology, or property. For example, the government could issue land-usage rights to industry to use old military bases to build radio and cell site towers.

6.4.11 Matching Grants

The government could encourage infrastructure investment by establishing matching grant programs whereby the government would match the funding dollars obligated by industry. This type of arrangement has been used previously through the Civil Defense Act's 50/50 matching grant provisions for state governments to plan and prepare for various emergencies and disasters. FEMA administers the Civil Defense Act grants in which monies can be used for a wide variety of purposes. Most often, the money supports the construction and equipping of local emergency operation centers.

6.4.12 Tax Credit

Tax credits would provide a direct debit to a corporation's income-tax liability, rather than a favorable factor for computing that liability. This tax credit would encompass specific enhancements at an even more favorable rate. The tax benefit would have to be targeted as precisely as possible to avoid unacceptable revenue loss to the Treasury. The government could create tax incentives for targeted infrastructure investments.

6.4.13 Tax-Exempt Bonds

Tax-exempt bonds could be established like municipal bonds, allowing personal income tax exemption to investors who purchased bonds that were used to fund critical infrastructure development.

7. SUMMARY

This report provides a snapshot of current revenue sources and funding mechanisms available to public safety agencies. As noted during the interview process, the chief concern of agency budget staffs and public safety officials remains obtaining adequate and consistent funding for the life of a wireless system project. The report makes clear that there are no revenue sources or funding mechanisms specifically earmarked to meet public safety wireless needs.

This is the first in a series of reports to address the problem of funding public safety wireless systems. The next report will develop proposals for creating specific funding sources targeted to public safety wireless needs. Such proposals might include the use of spectrum revenues to establish a grant for public safety wireless systems or establishing a public safety wireless trust fund or by adopting the "best practices" used to fund other capital programs or major information technology initiatives.

Additional information or comments regarding this report from federal, state, and local public safety officials and other interested parties are welcomed. Please forward your comments to: Kathryn von Forell, Booz · Allen & Hamilton, who may be contacted at fax number (703) 902-3465, telephone (703) 917-2108, or e-mail at von_forell_kathryn@bah.com.

APPENDIX A

ABBREVIATIONS AND ACRONYMS

APPENDIX A

ABBREVIATIONS AND ACRONYMS

ACF	Arizona Community Foundation
ALS	Advanced Life Support
APS	Arizona Public Service Company
ATF	Bureau of Alcohol, Tobacco, and Firearms
AT&T	American Telephone and Telegraph
BAN	Bond Anticipation Note
BJA	Bureau of Justice Assistance
BJIS	Bureau of Justice Information System
BLS	Basic Life Support
CCAP	Circuit Court Automation Project
CHP	California Highway Patrol
CIP	Capital Improvement Plan
COP	Certificate of Participation
COPS	Community Oriented Policing Services
COPS MORE	Community Oriented Policing Services More
DEA	Drug Enforcement Agency
DoC	U.S. Department of Commerce
DoJ	U.S. Department of Justice
EBS	Emergency Broadcast System
ECC	Emergency Communications Center
ECN	Emergency Communications Network
EMS	Emergency Medical Service
FBI	Federal Bureau of Investigation
FCC	Federal Communications Commission
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
FHA	Federal Highway Administration
FY	Fiscal Year
GAN	Grant Anticipation Note
GO	General Obligation
GPR	General Purpose Revenue
HB	House Bill
HUD	Housing, Urban Affairs, and Development Agency
INS	Immigration and Naturalization Service
IRS	Internal Revenue Service
IT	Information Technology
ITIF	Information Technology Investment Fund
LEC	Local Exchange Carrier
LLEBG	Local Law Enforcement Block Grant
LMR	Land Mobile Radio

LRB	Lease Revenue Bonds
MDCS	Mobile Data Communication System
NCCD	National Council on Crime and Delinquency
NDoT	Nevada Department of Transportation
NHTSA	National Highway Traffic Safety Administration
NTIA	National Telecommunication and Information Administration
OCCP	Office of Crime Control and Prevention
OMB	Office of Management and Budget
PSWN	Public Safety Wireless Network
PTFP	Public Telecommunications Facility Program
RAN	Revenue Anticipation Note
TAN	Tax Anticipation Note
TIIAP	Telecommunications and Information Infrastructure Assistance Program
TREAS	Department of the Treasury
VAWA	Violence Against Women Act
UCAN	Utah Communications Agency Network
USPIS	United States Postal Inspections Service
USPP	United States Park Service
U.S.C.	United States Code
USCG	United States Coast Guard
USSS	United States Secret Service

APPENDIX B

REFERENCES

APPENDIX B

The Federal Budget Process

The Federal Budget Making Process—Formulation of the Budget. The President is responsible for establishing general budgetary and fiscal guidelines for federal spending. Based on these guidelines, the Office of Management and Budget (OMB) works with federal agencies to establish specific policy directions and the fiscal requirements needed to conduct their policy goals. This period is marked by a constant exchange of information between the agencies, the OMB, and other executive agencies.

In the fall, agencies submit requests outlining for the OMB justification for their fiscal requirements. OMB staff review the requests and recommend changes. The OMB and agencies will discuss the recommended changes and reach an agreement. After an agreement is reached, the OMB prepares the President's final budget to be submitted to Congress.

Congressional Action on the Budget. After receiving the President's budget, which generally occurs in February, Congress considers the President's budget proposals, and either approves, modifies, or rejects them. Congress can change funding levels, eliminate programs, or add programs not requested by the President. Furthermore, Congress can add or eliminate taxes, or make changes that affect the amount of taxes levied.

Congress follows a two-step process in passing the budget: authorization and appropriation. Through its standing committees, Congress first passes laws authorizing federal agencies and programs and then recommends funding them at certain levels. Some programs must be authorized annually, some are authorized for several years, and some are authorized indefinitely. After spending is authorized, the Budget Committee initiates the concurrent resolution on the budget. Budget resolutions are not laws and do not require presidential approval. When Congress adopts the budget resolutions, it sends the resolutions to the Committee on Appropriations and its subcommittees. The Committee on Appropriations, through its subcommittees, proposes to appropriate the money through appropriations bills.

Appropriations bills are initiated in the House. The House Committee on Appropriations has the following 13 subcommittees, each of which has jurisdiction over a certain portion of the budget:

- Subcommittee on Agriculture, Rural Development, the Food and Drug Administration, and Related Agencies
- Subcommittee on Commerce, Justice, State, the Judiciary, and Related Agencies
- Subcommittee on the District of Columbia
- Subcommittee on Energy and Water Development
- Subcommittee on Foreign Operations, Export Financing, and Related Programs
- Subcommittee on the Interior and Related Agencies

- Subcommittee on Labor, Health and Human Services, Education, and Related Agencies
- Subcommittee on the Legislative Branch
- Subcommittee on Military Construction
- Subcommittee on National Security
- Subcommittee on Transportation and Related Agencies
- Subcommittee on Treasury, Postal Service, and General Government
- Subcommittee on Veterans Affairs, HUD, and Independent Agencies

Each subcommittee holds hearings and reviews detailed information concerning each budgetary request. After the bill is approved in the subcommittee, then the full committee, it proceeds to the House floor, or Committee of the whole, for passage or defeat. Should the legislation be passed with sufficient votes, it is then forwarded to the Senate. The Senate then reviews - and may modify the bill by amendment - and votes for passage or defeat by the whole Senate. If the bill is passed, but differs in content from the House version, a conference committee consisting of members from both legislative bodies resolves the differences. The conference committee report is returned to both the House and Senate for vote and subsequent approval or defeat of the measure.

After each appropriations bill is passed by both the House and Senate, it is submitted to the President for approval or veto. If the President vetoes a bill, the bill returns to Congress for modification and negotiations between the House and Senate and the executive and legislative branches of government. Congress can override a veto with a two-thirds vote. As of 1996, the President has had access to the line–item veto. A line–item veto allows the President to veto a specific measure in the bill without having to reject the entire bill. The bill becomes law with the President's signature.

If the budget bills are not approved at the beginning of the fiscal year, Congress can issue continuing resolutions that give agencies temporary emergency funding to operate until the budget bills are passed.

Budget Execution. The OMB apportions the appropriated funds to the agencies. The agencies must spend the money in a manner consistent with the appropriations laws. The Federal Anti-Deficiency Law of 1906 forbids entities, such as government agencies, from spending more than their appropriated amount. The OMB usually apportions funds by time periods (generally by quarter of the fiscal year) and sometimes by activities. Agencies may request that their money be reapportioned throughout the year to accommodate changing circumstances. Changing circumstances also may reduce the need for spending, in which case the President may withhold the money under limited circumstances as defined in the Impoundment Control Act of 1974.

Contact Information for Federal Grants

Federal Grants and Cooperative Agreements
An OMB Circular that addresses grants and cooperative agreements with state and local governments can be obtained through the Office of Federal Financial Management, Office of Management and Budget, Room 6015, New Executive Office Building, Washington, DC 10503, or call (202) 395-3993.

Community Oriented Policing Services More (COPS MORE) Grant
For further information contact the COPS Universal Hiring Program, Office of Community Oriented Policing Services (COPS), 1100 Vermont Ave., NW, Washington, DC 10530, or contact your state COPS Grant advisor:

COPS GRANT ADVISORS

STATE	ADVISOR'S NAME	PHONE NUMBER
Alabama	Jill Morris	(202) 616-9556
Alaska	Russell Kramer	(202) 616-9781
American Samoa	Steve Catalano	(202) 514-4867
Arizona	Jana Hackworth	(202) 616-9117
Arkansas	Marchelle Yoch	(202) 616-9590
California 109, 408, 510, 707, 916	Melissa Ferguson	(202) 514-1756
California 113, 310, 561, 619, 714, 760, 805, 818, 909	Yolanda Little	(202) 514-6364
Colorado	Carol Limburg	(202) 616-9113
Connecticut	Christine Schneider	(202) 616-9196
Delaware	Keesha Thompson	(202) 514-1901
District of Columbia	Becky Smith	(202) 514-4154
Florida 305, 561, 813, 941, 954	Darren Neely	(202) 307-3971
Georgia	Deborah Price-Schott	(202) 514-8947
Guam	Shellie Soloman	(202) 616-8987
Hawaii	Jana Hackworth	(202) 616-9117
Idaho	Kim Gorniak	(202) 616-6489
Illinois 847, 630, 708, 815	Vince Shay	(202) 616-1875
Illinois 117, 309, 618	Michelle Brickley	(202) 616-9554
Indiana	Lee Stokes	(202) 616-9111
Iowa	Josina Talbert	(202) 616-1887
Kansas	Matthew Perkins	(202) 616-5881
Kentucky	Dave Mehring	(202) 616-9115

STATE	ADVISOR'S NAME	PHONE NUMBER
Louisiana	Steve Catalano	(202) 514-4867
Maine	Peter O'Connor	(202) 514-9059
Maryland	Steve Meyer	(202) 616-9161
Massachusetts	Julius Dupree	(202) 616-9591
Michigan	Jamie French	(202) 616-9767
Minnesota	Jim O'Malley	(202) 305-0865
Mississippi	Jennifer Simpson	(202) 514-1088
Montana	Kim Gorniak	(202) 616-6489
Nebraska	Josina Talbert	(202) 616-1887
Nevada	Joseph Roach	(202) 616-8549
New Hampshire	Peter O'Connor	(202) 514-9059
New Jersey	Daniel Valencia	(202) 616-1879
New Mexico	Jana Hackworth	(202) 616-9117
New York	Roberta Houlton	(202) 616-9778
North Carolina	Dave Thomas	(202) 514-4465
North Dakota	Dionne Johnson	(202) 616-9773
Ohio	Tim Harding	(202) 616-9164
Oklahoma	Delka Perry	(202) 514-6398
Mofet, OK	Shellie Soloman	(202) 514-8987
Oregon	Kim Gorniak	(202) 616-6489
Pennsylvania	Will Keyser	(202) 616-1894
Puerto Rico	Marchelle Yoch	(202) 616-9590
Rhode Island	Christine Schneider	(202) 616-9196
South Carolina	Deborah Price-Scott	(202) 514-8947
South Dakota	Dionne Johnson	(202) 616-9773
Tennessee	Edward Mixon	(202) 616-1314
Texas 110, 511, 817, 915	Michael Carey	(202) 514-6378
Texas 114, 409, 913, 806, 903, 971	Tom Donnelly	(202) 616-9411
Utah	Melissa Furguson	(202) 514-1756
Vermont	Peter O'Connor	(202) 514-9059
Virgin Islands	Keesha Thompson	(202) 616-1901
Virginia	Anthony Burley	(202) 514-1156
Washington	Russell Kramer	(202) 616-9781
West Virginia	Steve Meyer	(202) 616-9161
Wisconsin	Sherly Katz	(202) 616-9763
Wyoming	Dionne Johnson	(202) 616-9773
NYC, LA, Chicago	Kristen Layman	(202) 616-1896

Edward Byrne Memorial State and Local Law Enforcement Assistance
For further information, contact the Bureau of Justice Assistance, 633 Indiana Avenue NW, Washington, DC 10531 or contact the Department of Justice Response Center at 1-800-411-6770.

Local Law Enforcement Block Grant
For more information contact the Bureau of Justice Assistance, 633 Indiana Avenue, NW, Washington, DC 10531, or call the Department of Justice Response Center at 1-800-411-6770.

Rural Outreach Network Development Program[84]
The Department of Health and Human Services' Rural Outreach Network Development Program awards grants to expand access to, coordinate, restrain the cost of, and improve the quality of essential health services, such as preventive and emergency services, by developing integrated health care delivery systems or networks in rural areas and regions. Funded projects include efforts to provide primary care services in rural areas, including mental health services, emergency medical services, prenatal care, free clinical services, and preventive health services. Total obligations for the program in FY96 and FY97 were $16 million each. The same is forecasted for FY98. The range of financial assistance is $50, 000 – $100,000.

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[84] General Services Administration (GSA), "Rural Outreach Network Development Program," Catalog of Federal Domestic Assistance (FDAC), GSA Homepage, #http://gsacentral.gsa.gov/cgi-bin/waisgate?WAISconnType=&WAISdocID=1578328148+3+0+0&WAISaction=retrieve.

CONTACT INFORMATION FOR FOUNDATIONS THAT SUPPORT PUBLIC SAFETY

COMSAT Corporate Giving Program
6560 Rock Spring Dr.
Bethesda, MD 10817
Telephone: (301) 114-3700
Michele H. Tennery, Community Relations Manager. Mgr.
Fields of interest: Crime and law enforcement, education; engineering and technology; higher education; minorities, immigrants, centers and services, performing, theater, political science; science, visual arts.

The Coastal Corporate Giving Program Coastal Tower
Nine Greenway Plaza East, Suite. 714
Houston, TX 77046
Telephone: (713) 877-1400
Contact: Wellington F. Osterloh, Director of Public Relations.
Purpose and activities: Monetary donations have been made in areas of the arts, education, public T.V., volunteer fire groups, and diabetes.

The Hazel Dell Foundation, Inc.
1013 Centre Rd., Suite 350
Wilmington, DE 19805
Purpose and activities: Giving primarily for hospitals and medical centers, secondary and higher education, and for local police and fire departments.
Geographic focus: Connecticut; New Jersey; California
Selected grants: The following grants were reported in 1994.
$1,000 to Fairfield Fire Department, Fairfield, CT.
$1,000 to Fairfield Police Department, Fairfield, CT.

Coshocton Foundation
110 South Fourth St.
P.O. Box 55
Coshocton, OH 43811
Telephone: (614) 611-0010
Contact: Orville Fuller, Treas.
Purpose and activities: Support largely for the improvement of a park and the downtown area; giving also for a museum, health services, higher education, and a county-wide leadership program.
Geographic focus: Ohio
Selected grants: The following grants were reported in 1995.
$11,885 to Emergency Medical Services of Coshocton County, Coshocton, Ohio, for automatic external defibrillators.

The Edna McConnell Clark Foundation
150 Park Ave., Rm. 900
New York, NY 10177-0016
Telephone: (111) 551-9100
FAX: (111) 986-4558

Purpose and activities: Programs are presently directed toward five specific areas: creating partnerships between communities and child protective services agencies to better protect children from abuse and neglect; promoting the development of effective, economical, and humane systems of criminal sanctions for adult offenders in selected states; preventing family homelessness in New York City neighborhoods by strengthening families, buildings, and blocks; increasing the academic performance of urban middle school students through systemic, standards-based reform; and advancing the means to control disease and improve health in several African countries. The foundation also maintains a small Special Projects category to support projects that serve people from poor and disadvantaged communities but that fall outside, or cut across, the established program areas.

Selected grants: The following grants were reported in 1995.
$945,000 to Vera Institute of Justice, New York, New York. For workshops to convene steering committees to review and strengthen reform efforts in criminal justice, payable in installment during 1.15 years. $400,000 to Center for Effective Public Policy, Silver Spring, Maryland, to continue work to develop effective sentencing practices that appropriately use community punishments and to expand these practices into additional counties in North Carolina and Oklahoma.

FEDERAL REVENUE SOURCES[85]
Federal Taxes
Property
- Individual Income
- Corporation Income
- Sales and Gross Receipts
    - Customs Duties
    - Selective
        - Motor Fuel
        - Alcoholic Beverages
        - Tobacco Products
        - Public Utilities
- Motor Vehicle and Operators' Licenses
- Death and Gift

Federal Surcharges
- National Defense and International Relations
- Postal Service
- Education
    - School Lunch Sales
    - Higher Education
- Natural Resources
- Hospitals
- Sewage
- Solid Waste Management
- Parks and Recreation
- Housing and Community Development
- Airports
- Water Transport and Terminals
- Special Assessments
- Sale of Property
- Interest Earnings
- Utility
- Insurance Trust Revenue

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[85] U.S. Department of Commerce, *Statistical Abstract of the United States*, 1996.

STATE REVENUE SOURCES[86]
- State Taxes
  - Sales and Gross Receipts
  - General
  - Motor Fuels
  - Alcoholic Beverages
  - Tobacco Products
- Licenses
  - Motor Vehicles
  - Corporations
- Individual Income
- Corporation Net Income
- Property
- Charges and Miscellaneous
- Intergovernmental Income
  - Federal Government
    - Public Welfare
    - Education
    - Highways
    - Other
- Utility Revenue
- Liquor Store Revenue
- Insurance Trust Revenue
  - Employee Retirement
  - Unemployment Compensation

COUNTY REVENUE SOURCES
- Intergovernmental Revenue
  - State Government
  - Federal Government
- Tax Revenue
  - Property
  - Charges and Miscellaneous

CITY REVENUE SOURCES
- Intergovernmental Revenue
  - State Government
- Taxes
  - Property
  - Sales and Gross Receipts
- Surcharges

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[86] Ibid.

- Utility and Liquor Store Revenue
  - Water System
  - Electric Power System
  - Gas Supply System
  - Transit System
  - Liquor Stores
- Insurance Trust Revenue